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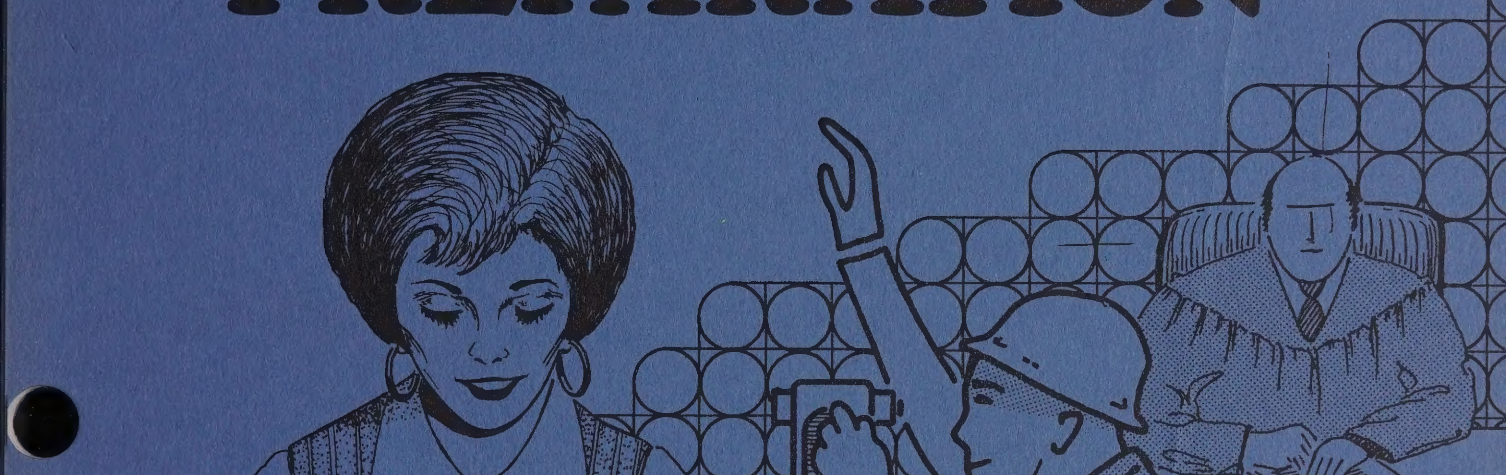
THE
CADASTRAL AND MAPPING TRAINING STAFF

CADASTRAL PLAT PREPARATION


TOWNSHIP 13 NORTH, RANGE 30 EAST, of the PRINCIPAL MERIDIAN of MONTANA
Dependent Survey
H.E. Weiss

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

TA
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.B874
1977

Course No. 9600 - ST - 17

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BUREAU OF LAND MANAGEMENT

CADASTRAL SURVEY TRAINING PROGRAM

Workbook
for

Cadastral Plat Preparation

Slide/Sound Program

Course No. 9600-ST-17

1977

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STUDENT INSTRUCTIONS

This workbook is designed to be used in conjunction with the slide/sound presentation on Cadastral Plat Preparation. The workbook contains only the highlights of the course materials along with work exercises, and is to be retained by the student for future reference.

Periodically throughout this program you will hear an audible cue with visual and verbal instructions directing you to complete an exercise in the workbook before continuing. The projectors automatically stop at the cue and will not continue until you push the RESTART button or else switch to OFF and then ON again. Also, a number of stops are built into this program to allow you time to compare and study certain slides at greater length. At these stops you will hear an audible chime and a small light just above the volume control will indicate that the program will not advance beyond this point. To continue with the program, just push the RESTART button.

When you reach the end of each reel, please rewind the tape, depress the SELECT button and rotate the slide tray to No. 0, then remove the trays and place in proper boxes. When you are finished with the entire program, turn both machines OFF.

TABLE OF CONTENTS

REEL/ SL. NO. ITEM PAGE NO.

I-13 CADASTRAL SURVEY PLATS AS DEPICTIONS (DEFINITION) 1
I-15 CADASTRAL SURVEYS - TYPES 2
I-32 IMPORTANCE OF CADASTRAL SURVEY PLATS 3
II- 2 THE SYSTEM OF RECTANGULAR SURVEYS 8
II-22 TOWNSHIPS 14
II-41 SUBDIVISION OF SECTIONS 22
II-52 MINOR SUBDIVISIONS 28
III- 3 SURVEY AND PLATTING OF FRACTIONAL SECTIONS 32
III-45 LOT IDENTIFICATION 40
IV- 2 PLAT REQUIREMENTS 46
IV-27 PLAT REQUIREMENTS DEPENDENT ON SURVEY 52
V- 3 ADDITIONAL REQUIREMENTS DEPENDENT ON SURVEY 58
VI- 4 SOURCES OF INFORMATION FOR PLAT PREPARATION 74
VI-21 LAND STATUS RECORDS 80
VI-31 MASTER TITLE PLATS 84
VII- 4 PARENTHETICAL DISTANCE DETERMINATION 90
VII-19 ACREAGE COMPUTATIONS - AVERAGING METHOD 96
VII-37 DEFINITION OF METES AND BOUNDS SURVEYS 102

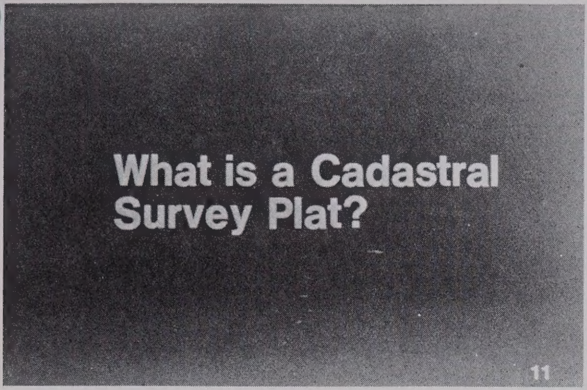
GEOGRAPHIC POSITIONS

VIII- 3 a. Definition and Sources 104
VIII-18 b. Geographic Position Scaling 108
VIII-57 c. Computations with Meridian (M) and Parallel (P) Factors 114
IX-6 d. Mean Geographic Latitude of Traverse Lines 124
IX-37 e. Geographic Position from Field Survey Data 130
IX-55 f. Realistic Geographic Positioning 136
X- 3 g. Continuation of Realistic Geographic Positioning (Exercise Problem Page 147) 143

TABLE OF CONTENTS

REEL/ SL. NO.	ITEM	PAGE NO.
X- 8	DEPICTING PLAT SURVEY DATA	144
X-11	LINES, SYMBOLS, TOPOGRAPHY	155
XI- 3	LAYOUT OF THE SURVEY DATA	160
XI-17	SPECIAL REQUIREMENTS FOR CERTAIN PLATS	166
XII- 3	ORDER OF PLAT CONSTRUCTION	170
XII- 8	Regular Subject	171
XII-21	CONTINUATION OF ORDER OF PLAT CONSTRUCTION (Irregular and Regular Subjects)	176
XII-48	COMPLETING THE PLAT	177
	SUPPLEMENTAL MATERIALS:	Separate Envelope

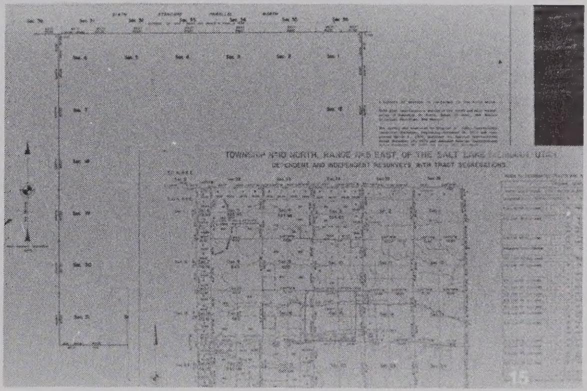
Kehl Ridge, Arizona 7½ Minute topographic map; BLM M & P Factors booklet; MT Plat guide and abbreviation sheet; Topographic Map Symbols sheet; summary sheet for geographic positioning.

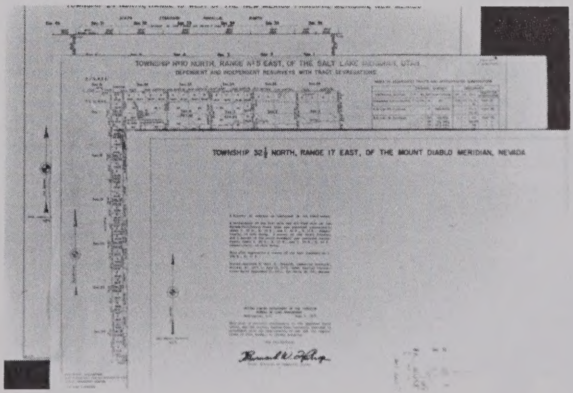


What is a Cadastral Survey Plat?

The word "cadastral" relates to the showing and recording of property boundaries.

Cadastral surveys serve three main purposes: the creation, establishment, and marking of land boundaries.

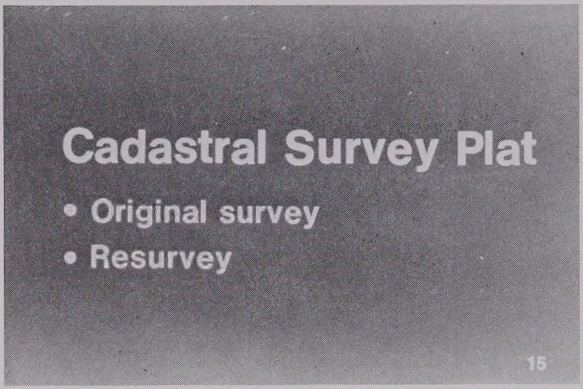




DEPENDENT AND INDEPENDENT RESURVEYS WITH TRACT SEGREGATIONS
TOWNSHIP 32½ NORTH, RANGE 17 EAST, OF THE MOUNT DIABLO MERIDIAN, NEVADA

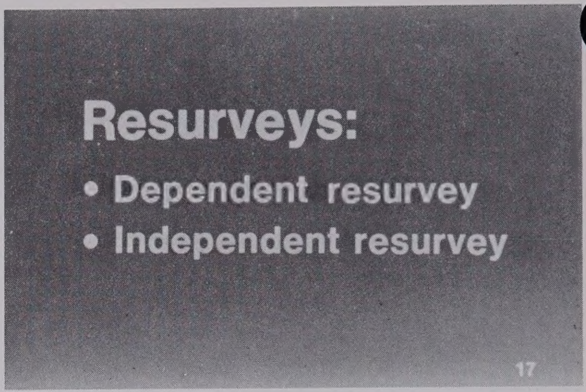
To support the survey, the plat will show four main items, and will include topography and cultural features to lesser extents.

CADASTRAL SURVEYS ARE OF MANY TYPES



Cadastral Survey Plat

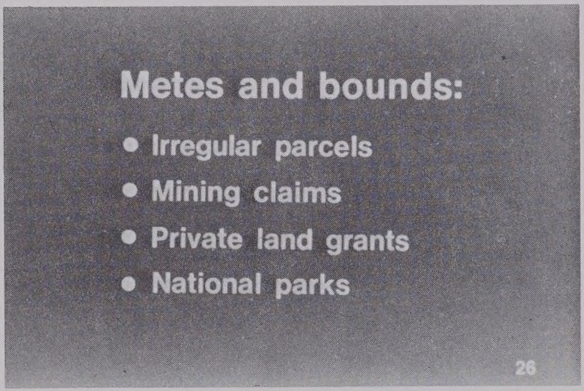
- Original survey
- Resurvey



Resurveys:

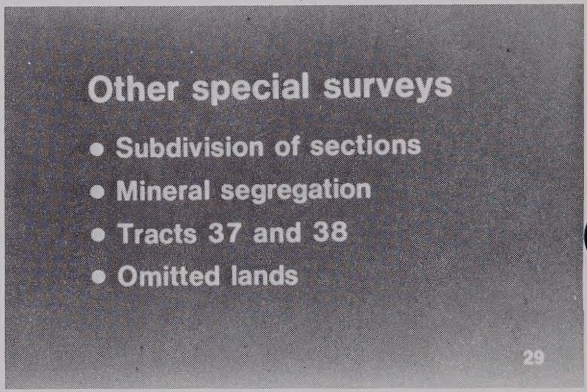
- Dependent resurvey
- Independent resurvey

Primarily, the surveys will either be original, or resurveys of original surveys; resurveys will either be dependent or independent.



Metes and bounds:

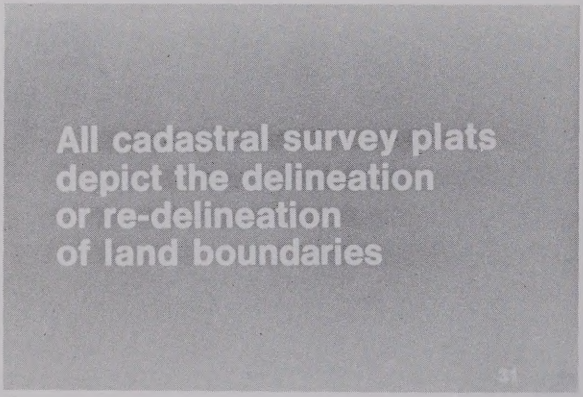
- Irregular parcels
- Mining claims
- Private land grants
- National parks



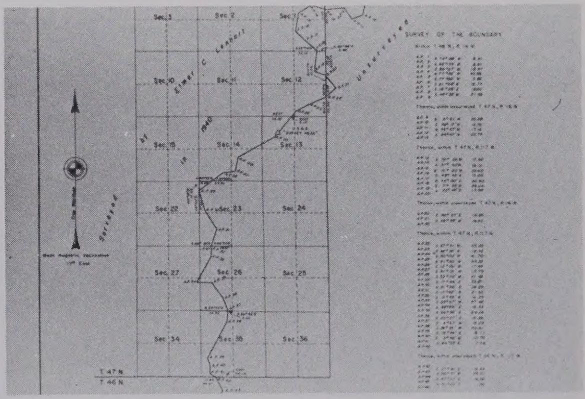
Other special surveys

- Subdivision of sections
- Mineral segregation
- Tracts 37 and 38
- Omitted lands

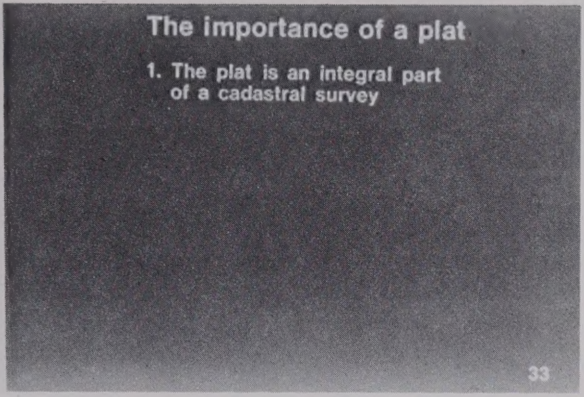
Other types of surveys, included in the original-resurvey general category are metes and bounds surveys, and other categories of special surveys such as accretion, mineral segregation, and townsite surveys.



All cadastral survey plats depict the delineation or re-delineation of land boundaries



However, regardless of the type of survey, the cadastral plat's primary function is to depict land boundaries.

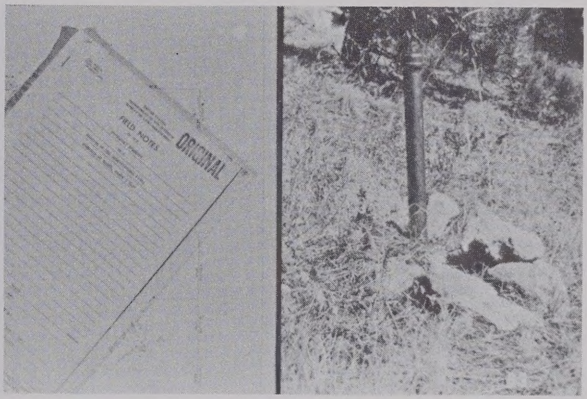


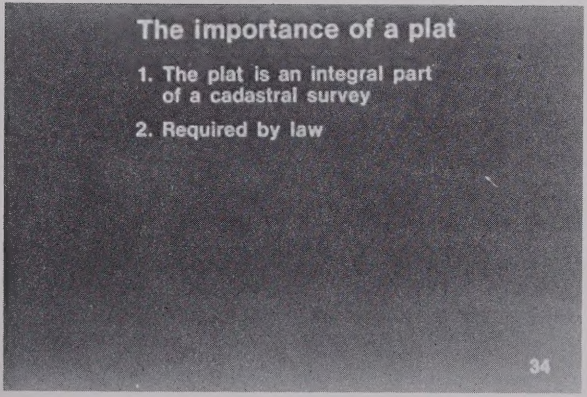
The importance of a plat

1. The plat is an integral part of a cadastral survey

The plat is one of the three main elements of a cadastral survey.

The field notes and monumentation constitute the two other principle components.

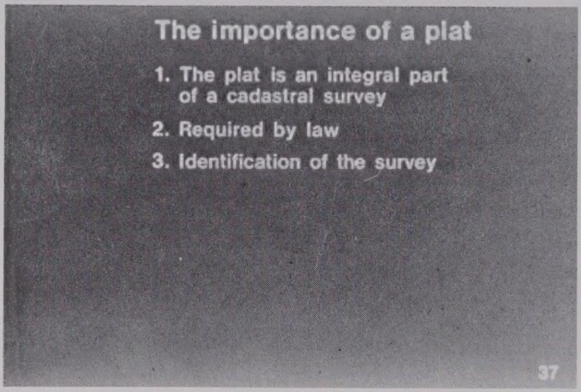




The importance of a plat

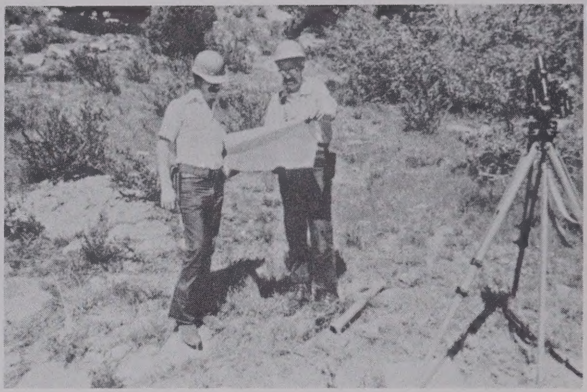
1. The plat is an integral part of a cadastral survey
2. Required by law

Beginning in 1785, various statutes have indicated the requirement for plats of every official survey.

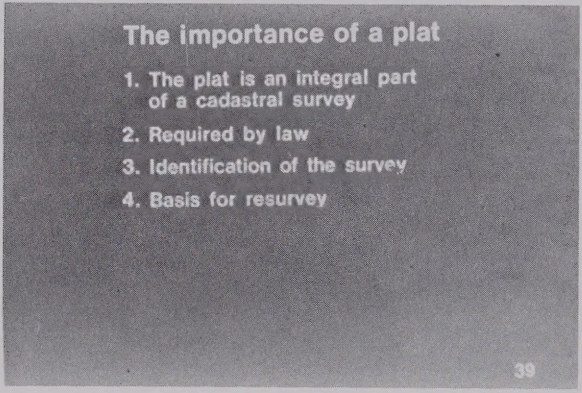


The importance of a plat

1. The plat is an integral part of a cadastral survey
2. Required by law
3. Identification of the survey

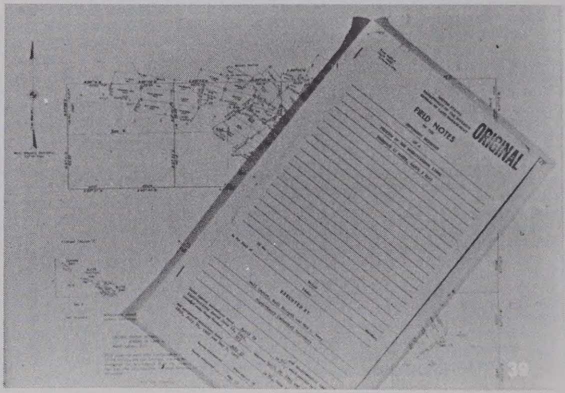


A plat becomes even more important when on the ground evidence is lost.

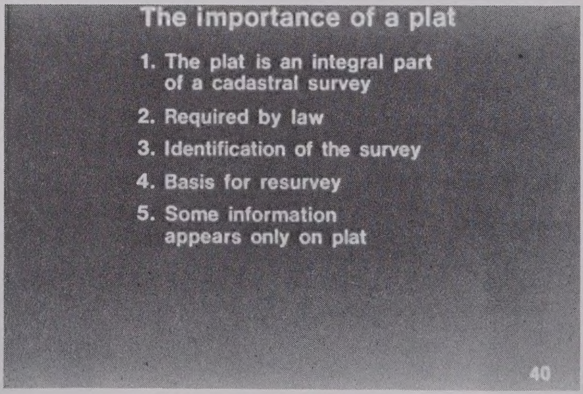


The importance of a plat

1. The plat is an integral part of a cadastral survey
2. Required by law
3. Identification of the survey
4. Basis for resurvey

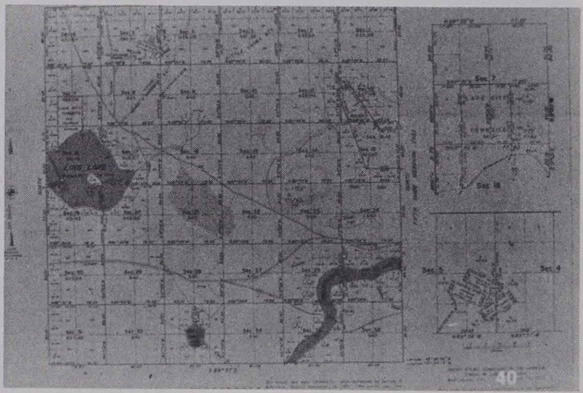


Resurveys are largely controlled by the information contained on the original plat.

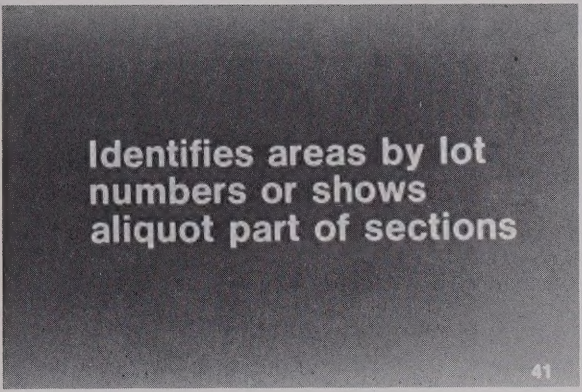


The importance of a plat

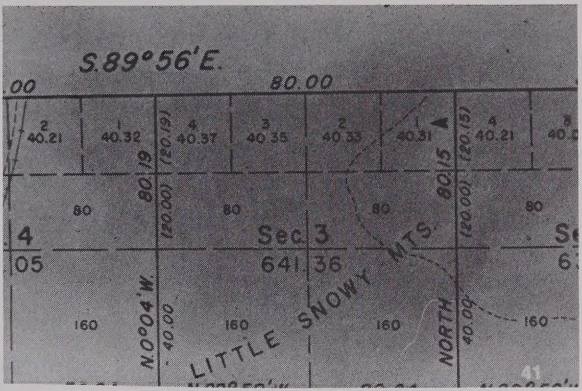
1. The plat is an integral part of a cadastral survey
2. Required by law
3. Identification of the survey
4. Basis for resurvey
5. Some information appears only on plat



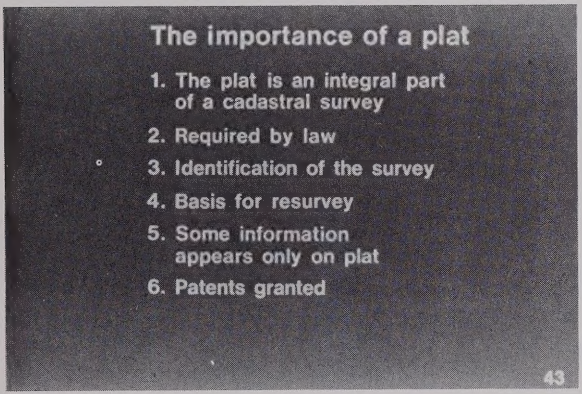
Dimensions and acreages are easily found on the plat.



Identifies areas by lot numbers or shows aliquot part of sections

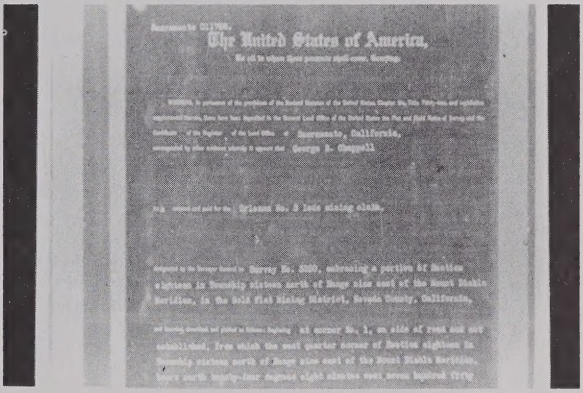


Lots and aliquot parts are also identified.



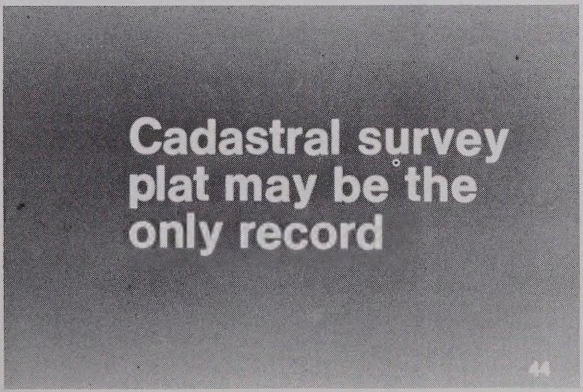
The importance of a plat

1. The plat is an integral part of a cadastral survey
2. Required by law
3. Identification of the survey
4. Basis for resurvey
5. Some information appears only on plat
6. Patents granted

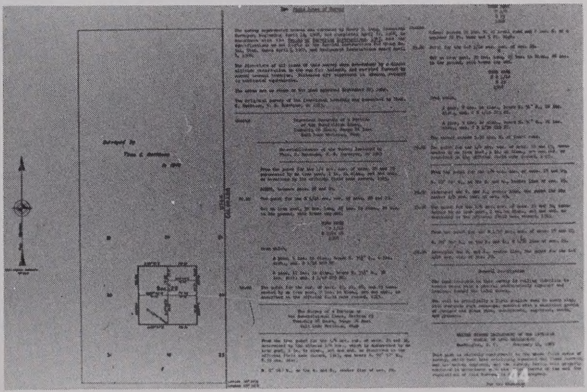


The United States of America,

Land patents are based on areas identified on the plat.



Cadastral survey plat may be the only record



In some cases the plat may be the only complete record of the survey.

Exercise No. 1

) A cadastral survey plat is a depiction of a particular area which includes: (eliminate one item)

Location
Boundaries
Surface Strata
Descriptions
Areas
Topographic and Cultural Features

2) Name the three elements of a cadastral survey.

3) There is no legal authority for requiring a plat of a Federal Cadastral Survey. TRUE or FALSE

4) List eight reasons why a cadastral survey plat is important.

5) A decision related to the legal significance of plats was made by the Supreme Court in the Cragin vs. Powell case. Briefly, what did the Court say about survey plats and conveyances?

Answers to Exercise No. 1

1) Eliminate "Surface Strata"

2) The marking of boundaries on the ground; the field notes; the plat.

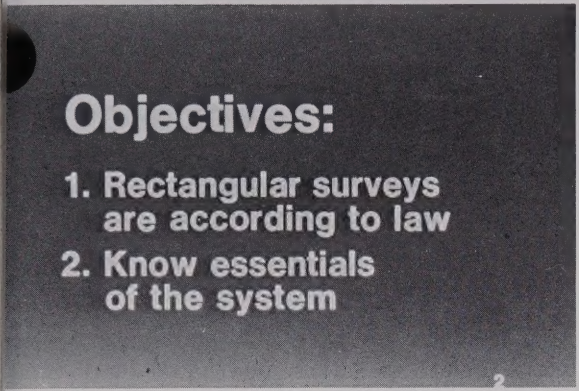
3) FALSE. Various statutes spell out the requirement, dating from the Northwest Ordinance of 1785.

4) The plat:

   a) is part of a cadastral survey
   b) is required by law
   c) shows dimensions and acreages
   d) identifies areas by lot numbers or aliquot parts
   e) may eventually become the only record of the survey
   f) is basic to patent issuance
   g) is a drawing of the area surveyed
   h) is the basis for resurveys

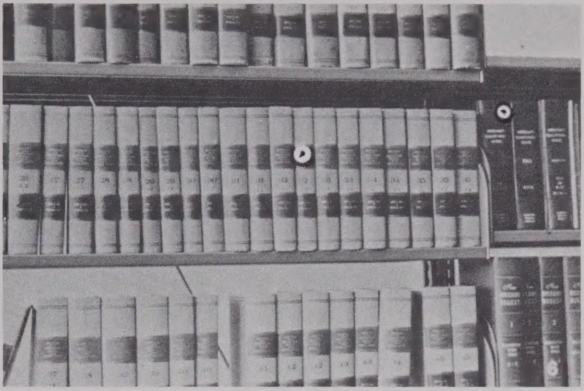
5) "... when lands are granted according to an official plat of the survey ... the plat itself, with all its notes, lines, descriptions and landmarks, becomes ... a part of the grant or deed by which ... conveyed ..."

REEL TWO

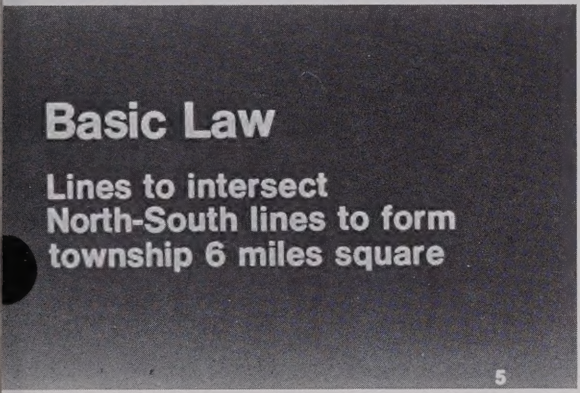


Objectives:

1. Rectangular surveys are according to law
2. Know essentials of the system

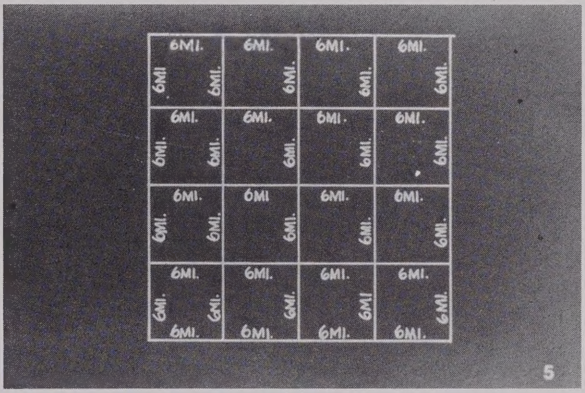


The laws of the United States control the rectangular system of surveys - beginning with the Ordinance of May 20, 1785 (The Northwest Ordinance), and continuing with various statutes and official decisions.

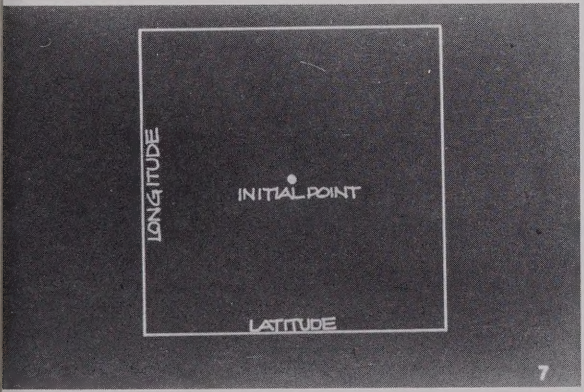


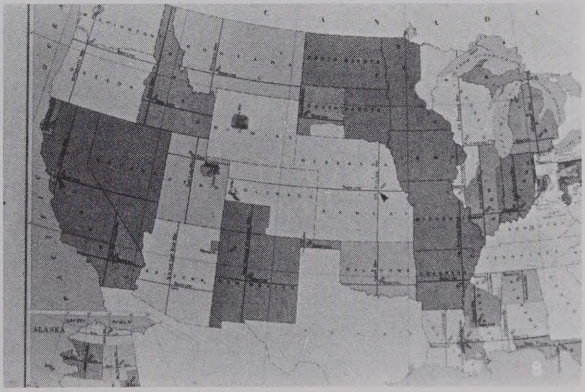
Basic Law

Lines to intersect North-South lines to form township 6 miles square



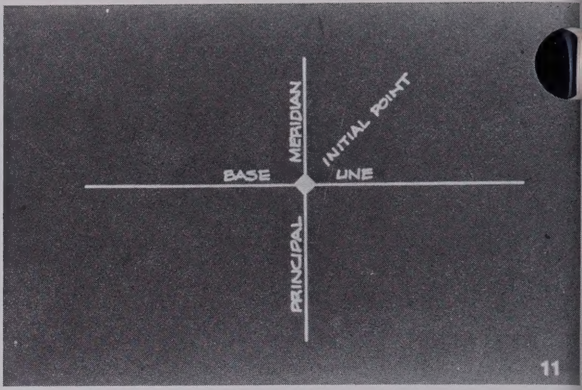
Very basically, the law provides for townships six miles square.



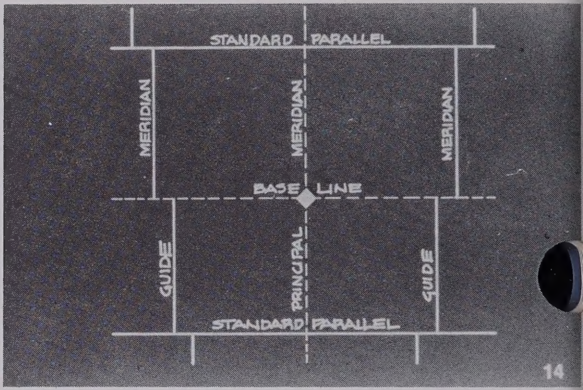


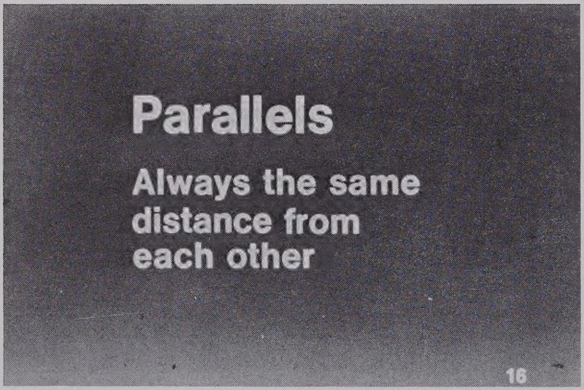
Every survey system starts somewhere; in the U.S. cadastral survey system, the concept of the initial point evolved.

From the initial points, Principal Meridians were surveyed along true north-south lines, and Base Lines were surveyed along true parallels of latitude.



Breaking the system down one step further, Guide Meridians and Standard Parallels were established.




Parallels

Always the same distance from each other

16

In general, the Standard Parallels are parallel to the Base Line, extending east-west to the limits of the particular system's coverage.

Guide Meridians

Do not meet guide meridians on North

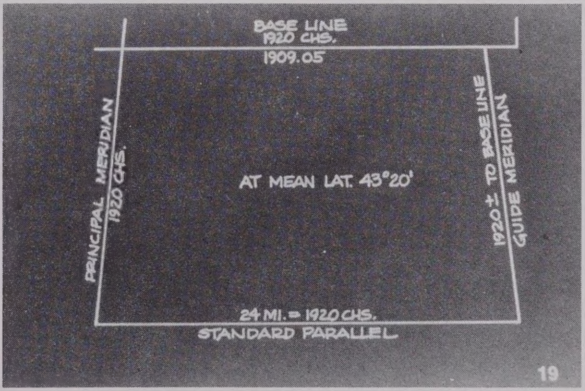
The Guide Meridians start on the Base Line, or on each Standard Parallel, and extend north to terminal positions at intersection with the next Standard Parallel.

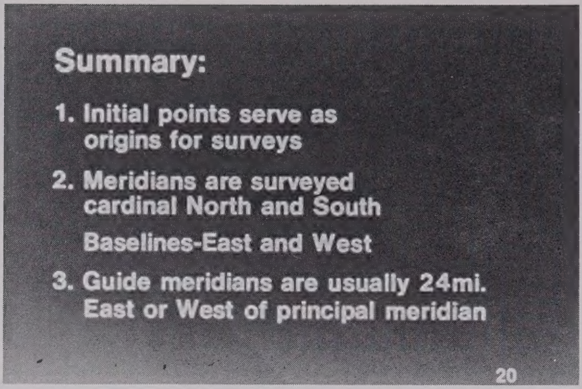
Principal of Convergence

Guide meridians curve toward Poles

In maintaining a true north direction, lines of longitude converge with increasing latitude.

Guide meridians must be offset at reasonable intervals (each standard parallel) in order to maintain a somewhat rectangular system.

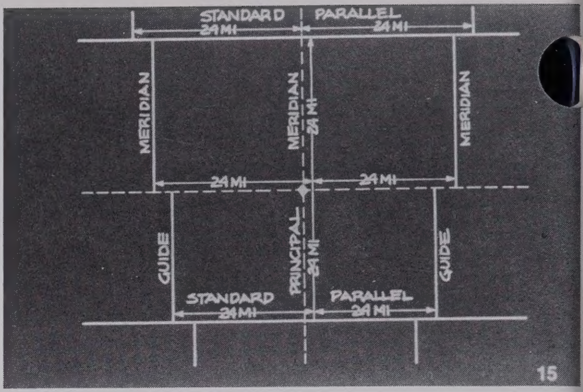




Summary:

1. Initial points serve as origins for surveys
2. Meridians are surveyed cardinal North and South

   Baselines-East and West
3. Guide meridians are usually 24mi. East or West of principal meridian



Most standard parallels and guide meridians are established at 24 mile intervals, however, there are numerous exceptions to this criteria.

Exercise No. 2

) The Ordinance of May 20, 1785 established the legal authority for the __________________ of ______________ surveys.

2) What is the function of initial points in the rectangular system of public land surveys?

3) Base lines are surveyed ______________ or ____________ from the initial point on a true parallel of latitude.

4) Principal meridians are surveyed cardinal ___________ or ___________ from the initial point.

5) Neighboring principal meridians and guide meridians are at a constant distance apart; base lines and standard parallels converge toward each other. TRUE or FALSE

6) In general, guide meridians are located at 24 mile increments east and west of principal meridians, and standard parallels are located at 24 mile increments north and south of base lines. TRUE or FALSE

7) The amount of meridional convergency is a function of ________________.

Answers to Exercise No. 2

1) system of rectangular

2) Initial points serve as origins for surveys to be extended in separated localities.

3) east or west

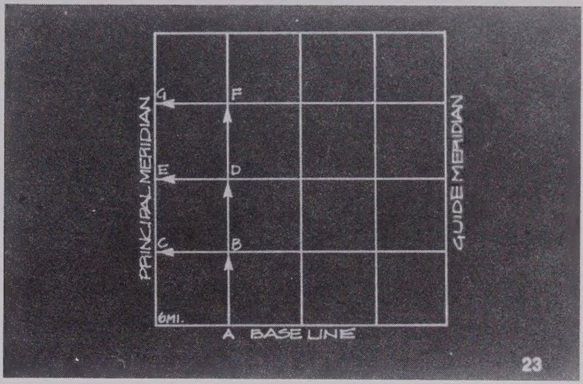
4) north or south

5) FALSE. The opposite condition prevails.

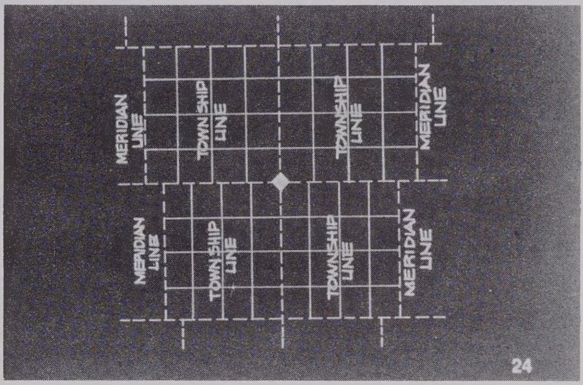
6) TRUE

7) Latitude

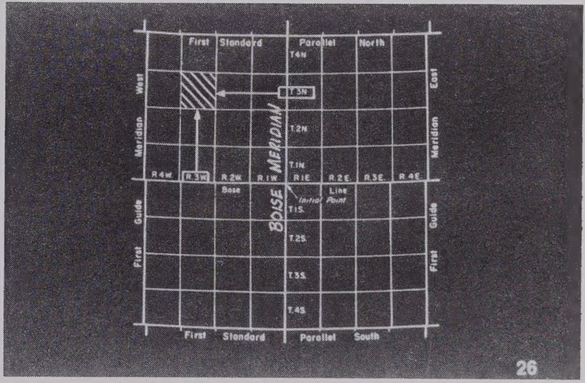
Within the framework of the meridian-parallel pattern, townships are formed at six mile intervals.

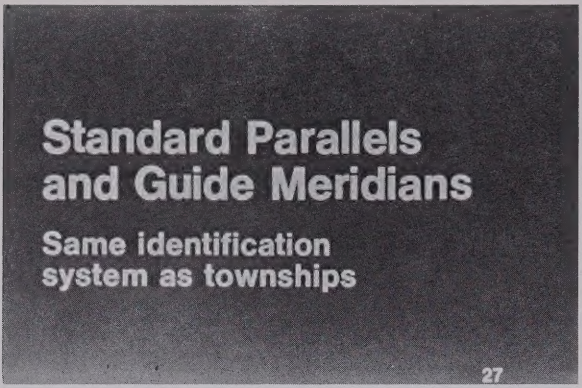


Again, the north-south township lines will be offset every 24 miles.



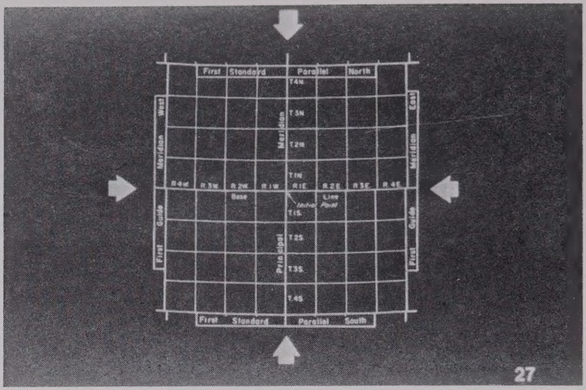
Beginning at the initial point, the townships are progressively numbered east or west as ranges, and north or south as "townships".





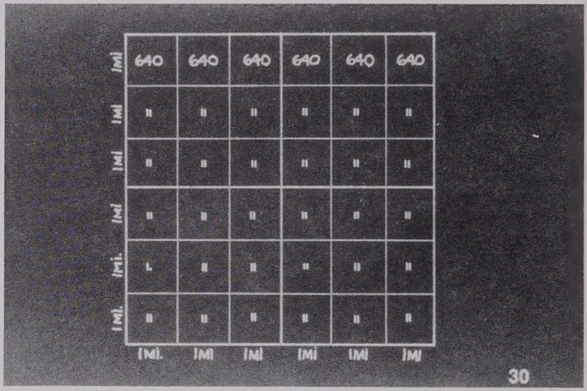
Standard Parallels and Guide Meridians

Same identification system as townships

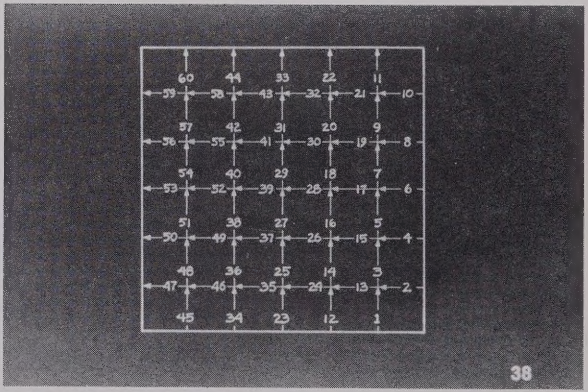

First Standard Parallel North
First Standard Parallel South
First Guide Meridian West
First Guide Meridian East
Principal Meridian
Base Line
Initial Point
T4N
T3N
T2N
T1N
T1S
T2S
T3S
T4S
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
27

Standard parallels and guide meridians are on the same identification plan as the townships.

Townships are divided into 36 sections, each containing 640 acres, as nearly as possible.

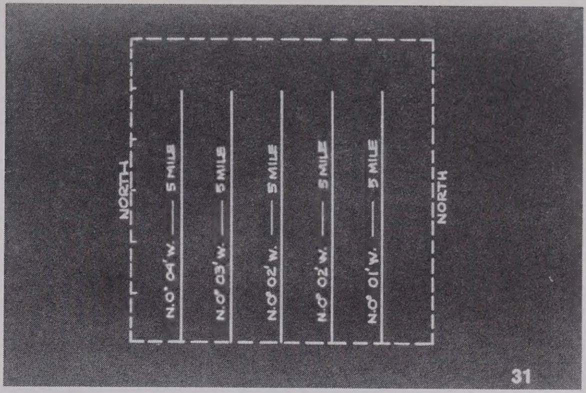


In subdividing a township, the meridional (north-south) lines have precedence in the order of survey ...

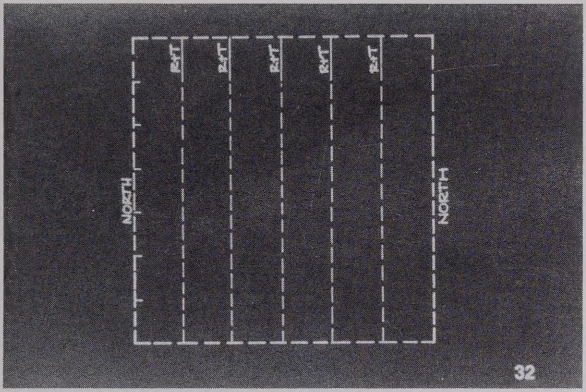


These meridional lines are established parallel to the township's east boundary; convergency considerations, then require slight deviations of the lines' bearings from direct north in order for the parallel requirement to be effected.

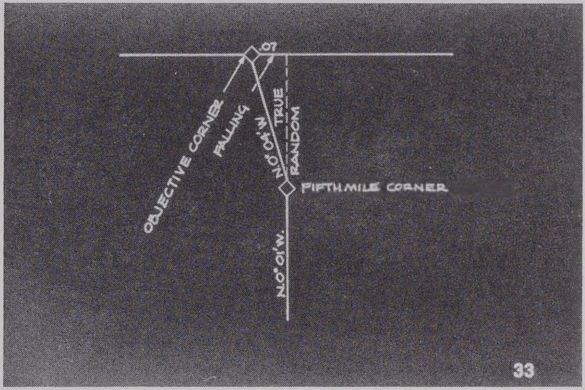
NOTE: See page 35 for a discussion of bearings.



31



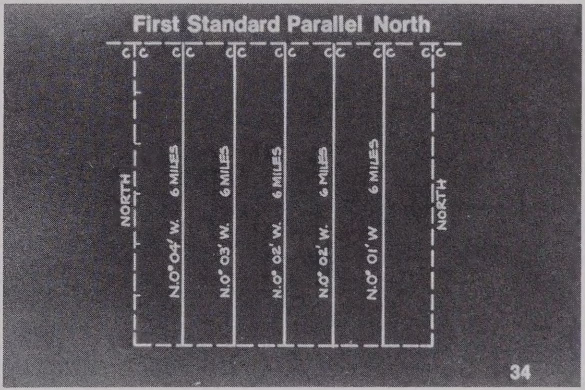
32



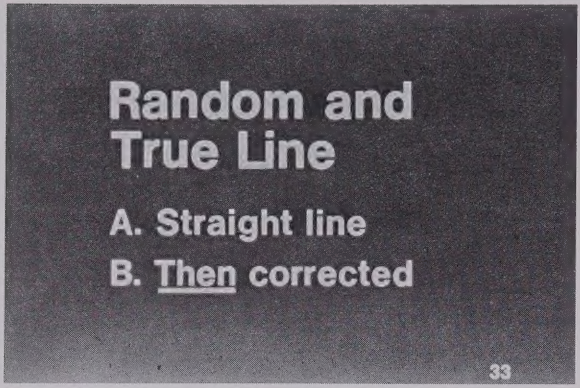
33

The last mile of each meridional line is surveyed "random and true", unless the line terminates on an offsetting line ...

For instance, the last mile of a meridional line ending on a standard parallel has the same bearing as the first five miles.



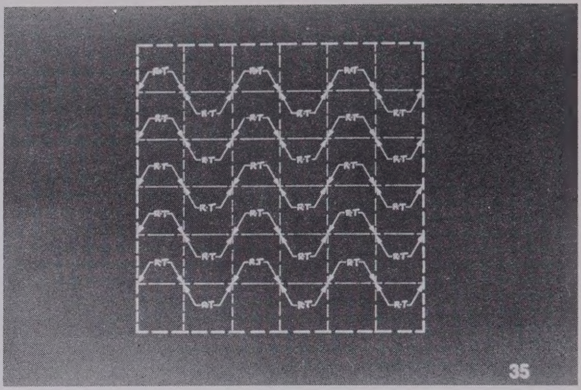
34



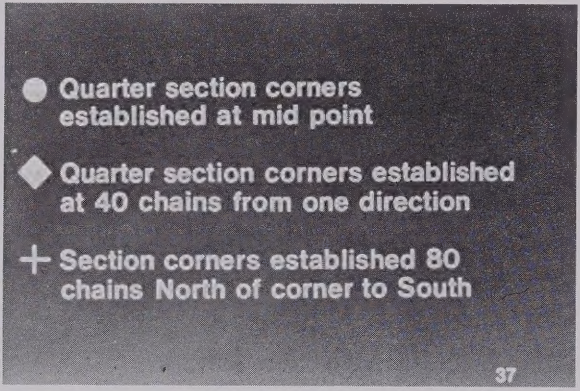
Random and True Line

A. Straight line

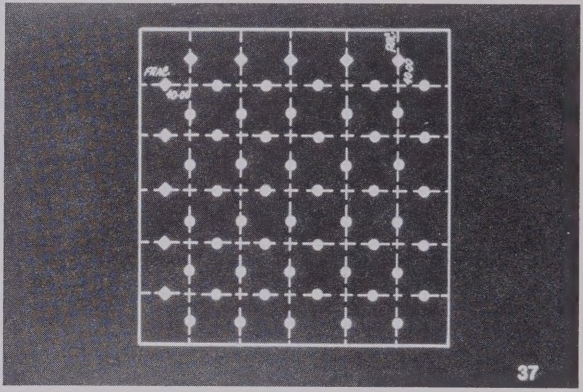
B. Then corrected



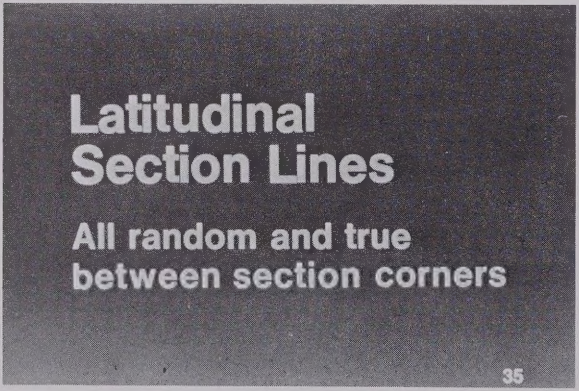
All of the township's east-west section lines are run random and true in order to correctly tie the previously set section corners on the meridional lines.



- ● Quarter section corners established at mid point
- ◆ Quarter section corners established at 40 chains from one direction
- + Section corners established 80 chains North of corner to South

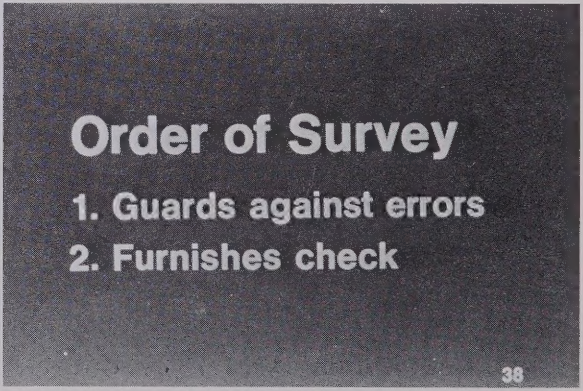


Section and quarter corners on the meridional lines are established at 40 chain intervals with excess or deficiencies placed in the last one half mile of the township.



Latitudinal Section Lines

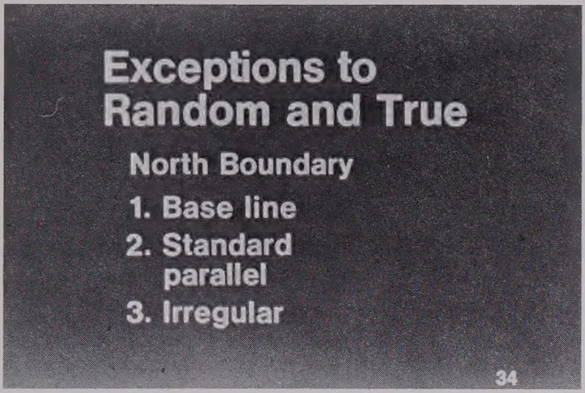
All random and true between section corners



Order of Survey

1. Guards against errors
2. Furnishes check

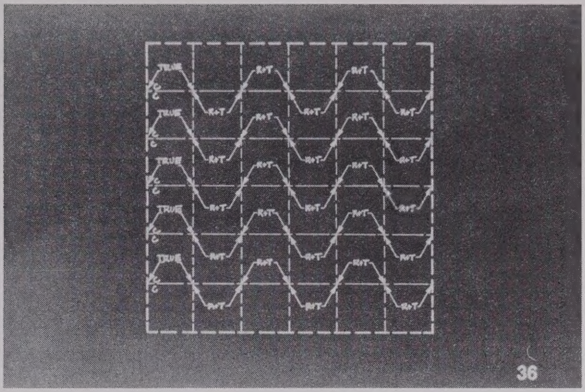
Quarter section corners on the east-west section lines are established at mid-point between section corners, except in the west range of sections, where they are placed at 40 chains west from the appropriate section corner.



Exceptions to Random and True

North Boundary

1. Base line
2. Standard parallel
3. Irregular



Closing corners (cc) are established where meridional and latitudinal section lines intersect limiting boundaries which do not have appropriate controlling corners.

Exercise No. 3

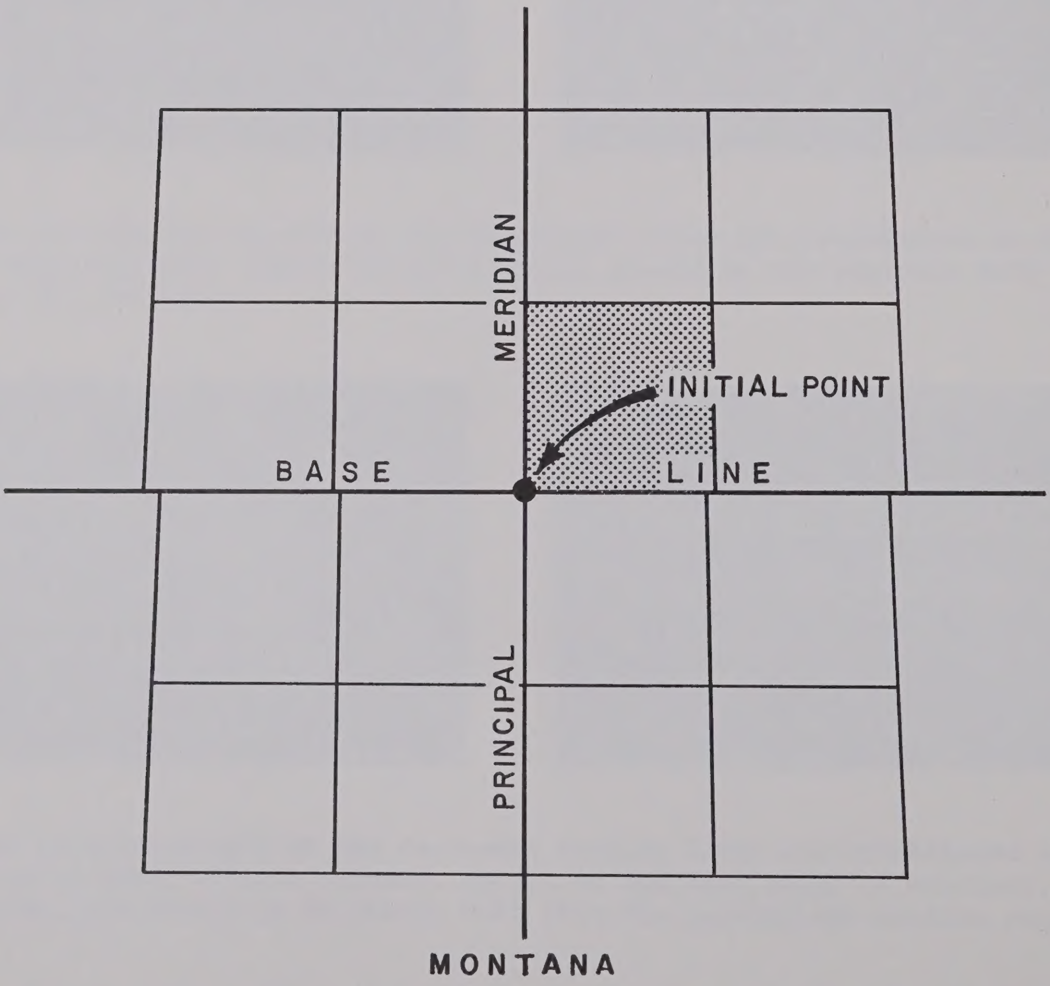
1) The township is the primary unit of survey and, by law, townships are to be ________ miles square. Technical problems (permit, do not permit) original surveys to be executed exactly in the above dimensions.

2) The east and south boundaries of a township are normally the governing lines for the subdivisional survey because ..... (complete the sentence).

3) Township identification is a function of direction (east, west, north, south) and distance (1, 2, 3, 4, etc.) in relation to the initial point.

TRUE or FALSE

4) Write a description for the shaded township. Use abbreviations.



5) Describe the plan for subdivision of townships, as dictated by law.

6) In a regular township, latitudinal section lines (east-west lines) are run random and true. A random and true line is a survey line which is first run by ________________, and is subsequently corrected to the __________ __________ between the controlling corners.

7) In original surveys, all 1/4 section corners are set at mid-point between section corners. TRUE or FALSE

8) Closing corners are intended to indicate the ________________ of a surveyed line at a boundary line already fixed in position.

Answers to Exercise No. 3

1) six ; do not permit

2) because the meridional lines which have precedence in the order of survey are initiated at the section corners on the south boundary of the township and are run north parallel to the east boundary.

3) TRUE

4) T. 1 N., R. 1 E., Principal Meridian, Montana

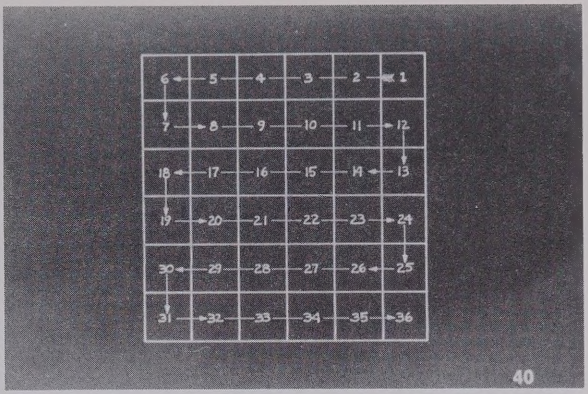
5) The township will contain 36 sections, each one mile square and containing 640 acres, as nearly as possible.

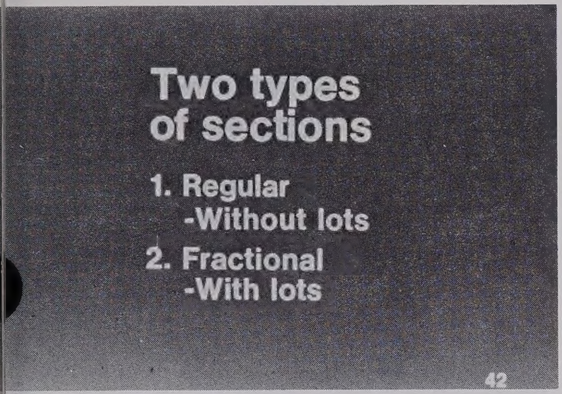
6) calculation; true bearing

7) FALSE. In the west tier of sections, the 1/4 section corners are set at 40.00 chains from the east, and in the north tier of sections, the 1/4 section corners are set at 40.00 chains from the south. Fractional measurements will then occur in the west and north half miles, respectively.

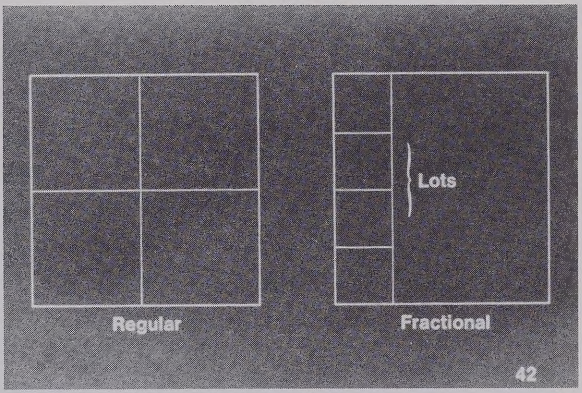
8) termination

The 36 sections of the township are numbered according to the standard plan.

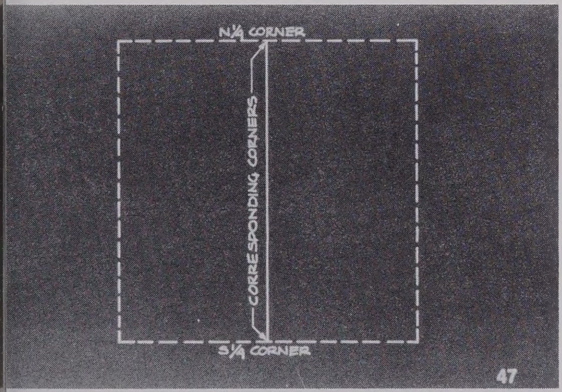


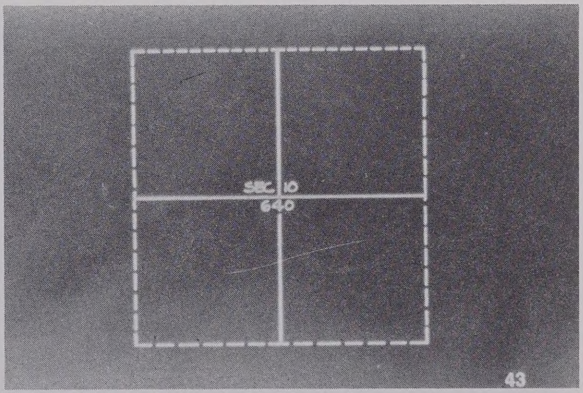

Two types of sections

1. Regular
   -Without lots
2. Fractional
   -With lots

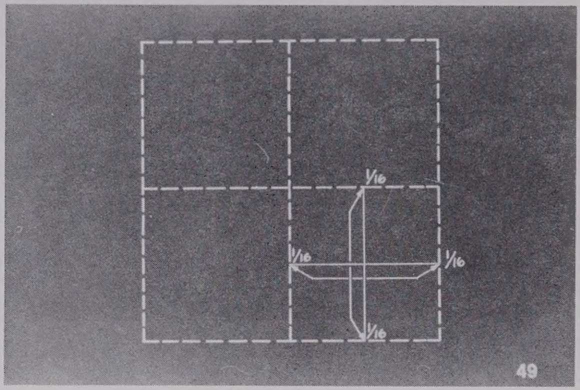


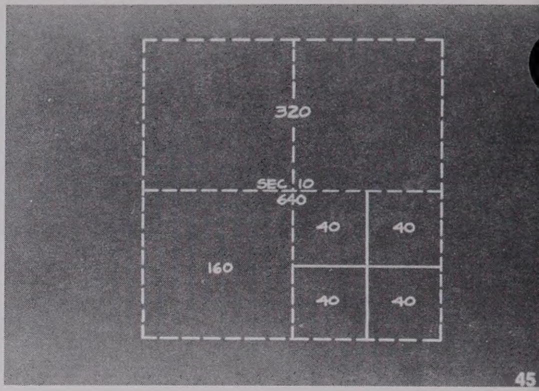
There are two types of sections.





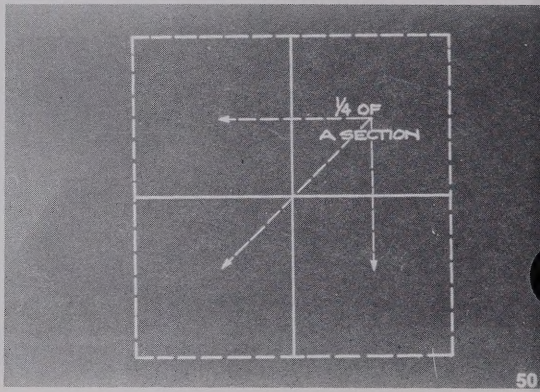
he basic plan for the subdivision of sections involves straight lines to orresponding corners.



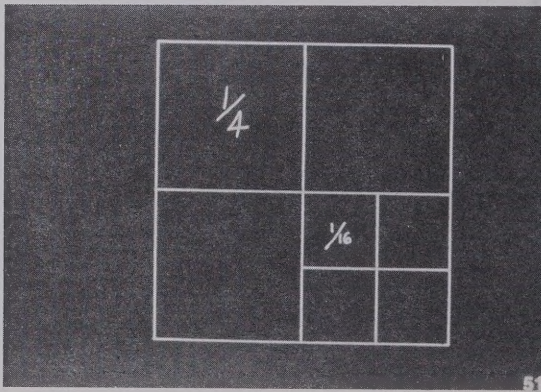


Smaller units of the section follow the same plan.

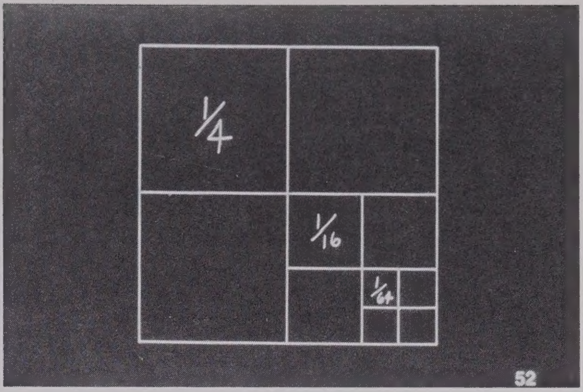
The term "aliquot part" refers to the dividing of a section into equal parts, as in a regular section.



A quarter of a regular section is further divided into sixteenths parts of the total section, the smallest legal subdivision unit in the rectangular survey system.

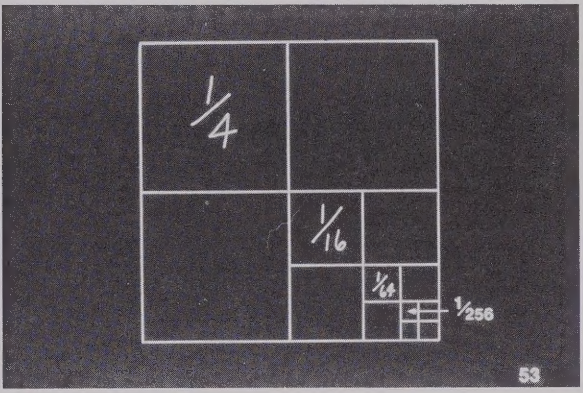


Sixteenths into
Sixty-Fourths



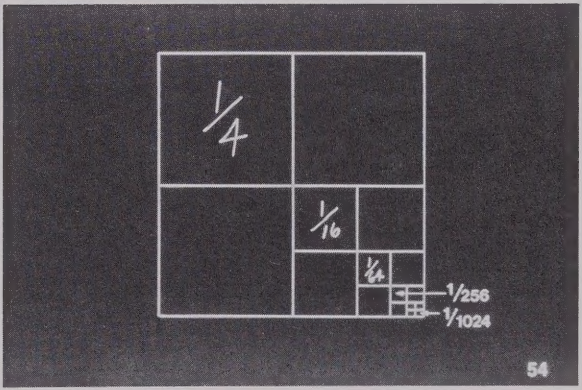
The sixteenth unit is further divided into four, one sixty-fourth aliquot parts.

Sixty-Fourths
into Two-Hundred
Fifty-Sixths

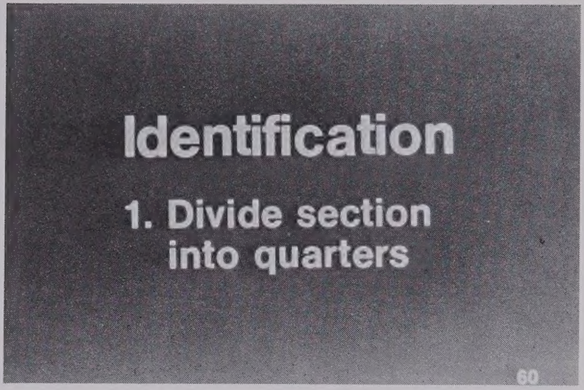


The one sixty-fourth unit is divided into four, one two hundred fifty-sixths parts.

256ths
into
1024ths

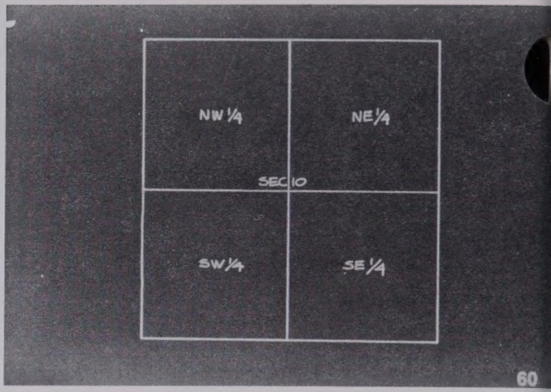


d, the one two hundred fifty-sixths units are divided into four, one one ousand twenty-fourths parts.

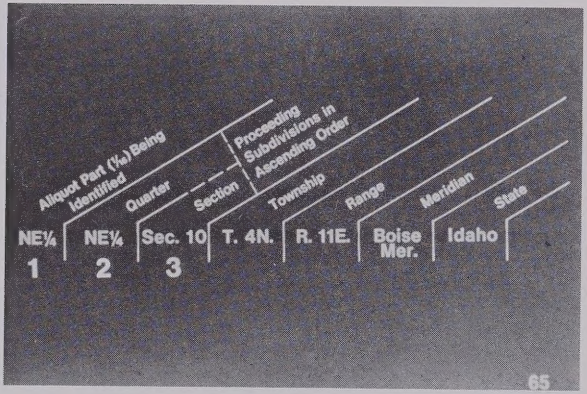


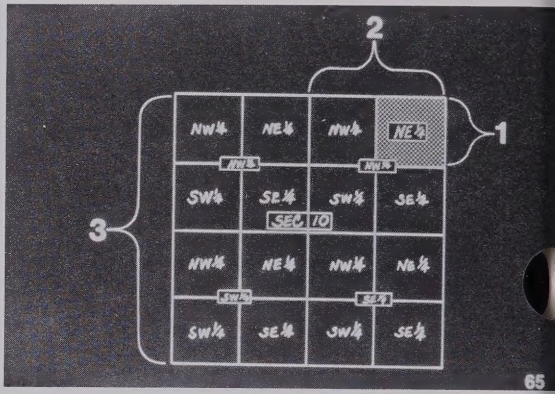
Identification

1. Divide section into quarters

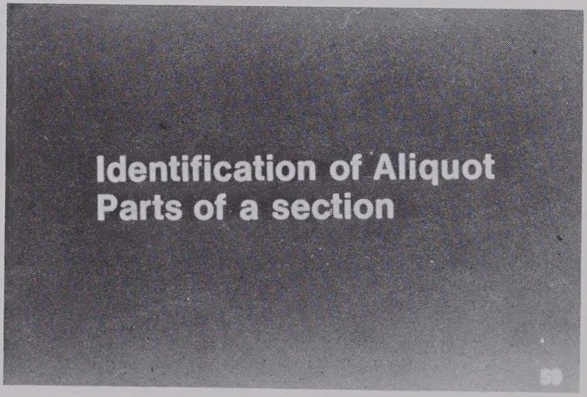


Each unit of section subdivision has a unique description.

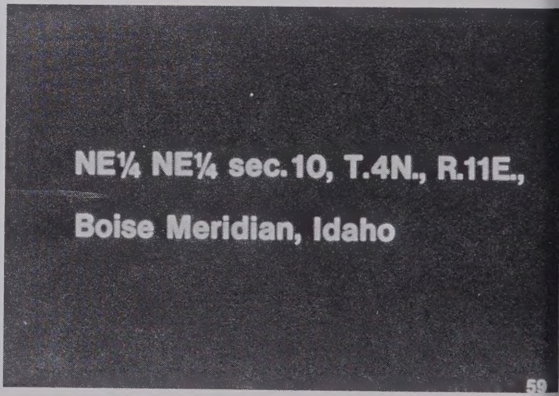




Start with the unit being described, and work up.



Identification of Aliquot Parts of a section

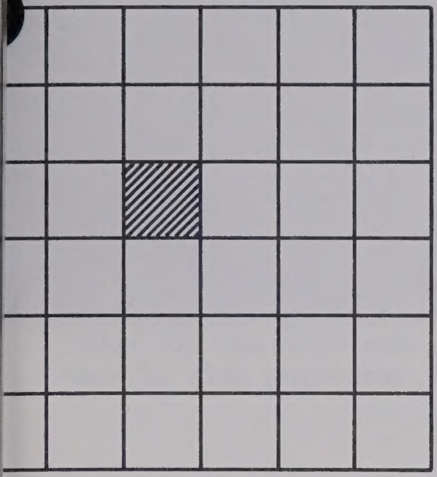


NE¼ NE¼ sec.10, T.4N., R.11E., Boise Meridian, Idaho

A complete description mentions all of the units of previous subdivision, with the controlling Principal Meridian and State.

xercise No. 4

) Identify the shaded section.



) Match the items below:

Section

Township

Corresponding Corners

Fractional Section

Regular Section

(a) Unit of Subdivision

(b) Contains Lots

(c) Opposite

(d) Unit of Survey

(e) No Lots

(f) 1/4 Corners

(g) 630 Acres

) Explain the term "linear quartering".

) 1/2, 1/4, 1/16, $\frac{1}{64}$, $\frac{1}{256}$, $\frac{1}{1024}$

The above fractions represent ____________ parts of a section.

) What is the smallest legal part of a section?

Answers to Exercise No. 4

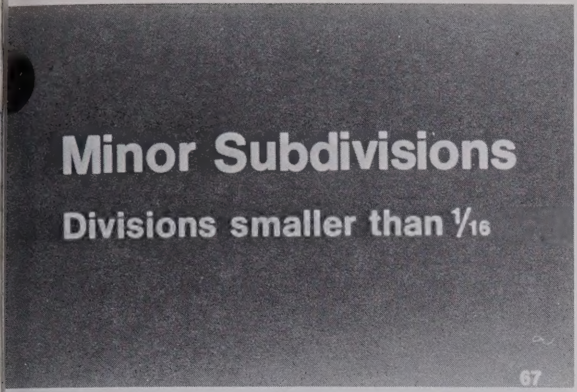
1) Section 16

2) Section - Unit of Subdivision
Township - Unit of Survey
Corresponding Corners - Opposite
Fractional Section - Contains Lots
Regular Section - No Lots

3) Linear quartering is the method by which regular sections are subdivided. Straight lines are run through the preceding unit of subdivision between corresponding corners.

4) aliquot

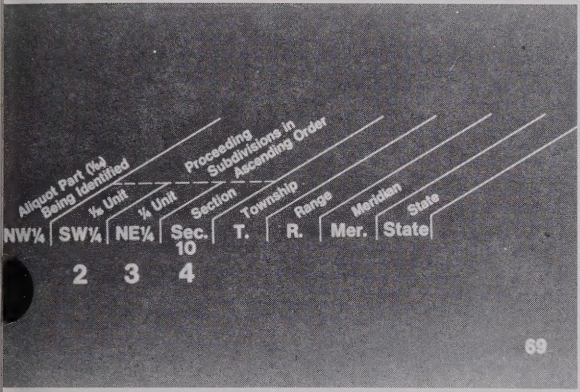
5) One-sixteenth part of section (or quarter-quarter section)



Minor Subdivisions

Divisions smaller than 1/16

It is sometimes necessary to subdivide sections into smaller areas than the sixteenth units.



Aliquot Part (1/64) Being Identified

1/16 Unit

1/4 Unit

Proceeding Subdivisions in Ascending Order

Section

Township

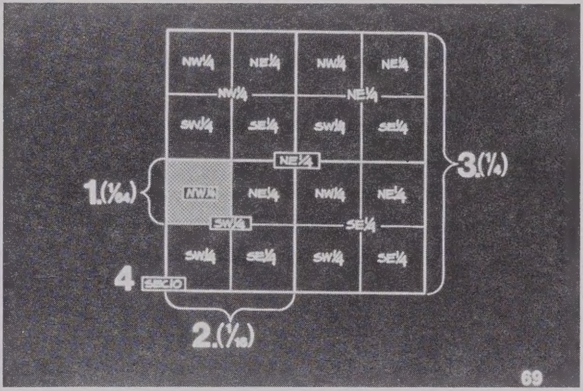
Range

Meridian

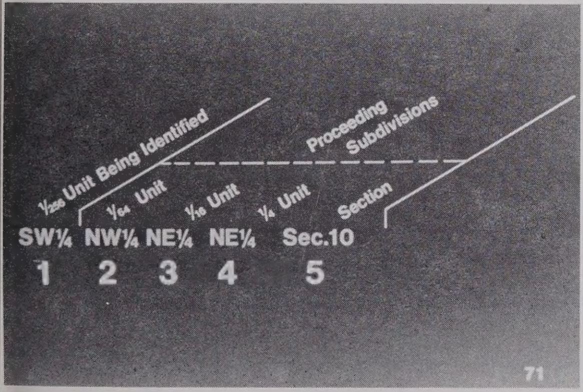
State

NW¼ | SW¼ | NE¼ | Sec. 10 | T. | R. | Mer. | State

2 3 4



A one sixty-fourth part of a section would first be described by its quadrant position within the particular sixteenth.



1/256 Unit Being Identified

1/64 Unit

1/16 Unit

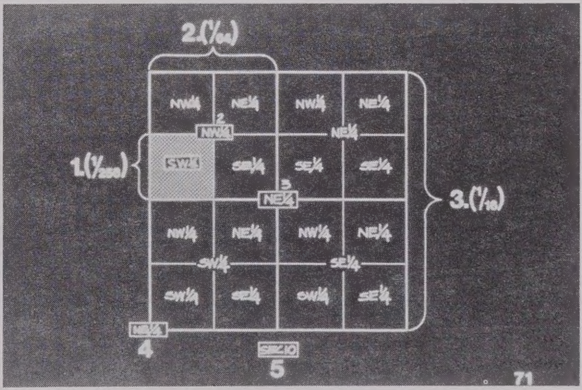
1/4 Unit

Section

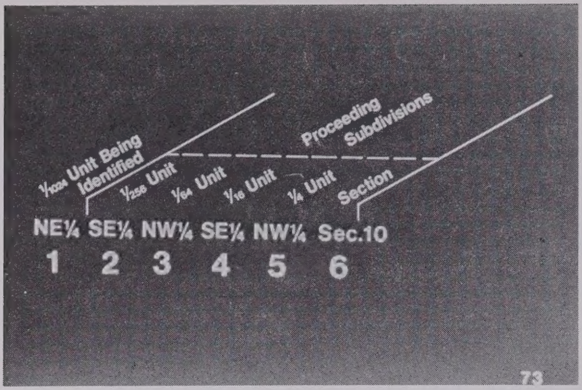
Proceeding Subdivisions

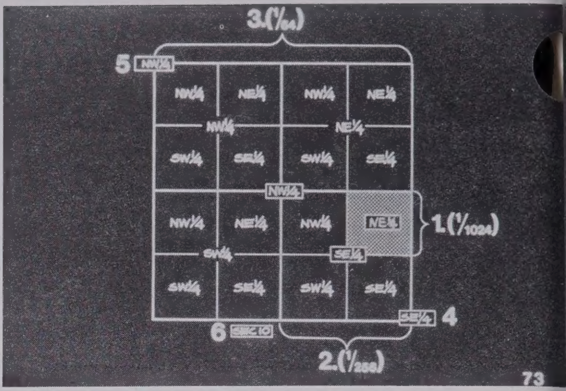
SW¼ NW¼ NE¼ NE¼ Sec.10

1 2 3 4 5

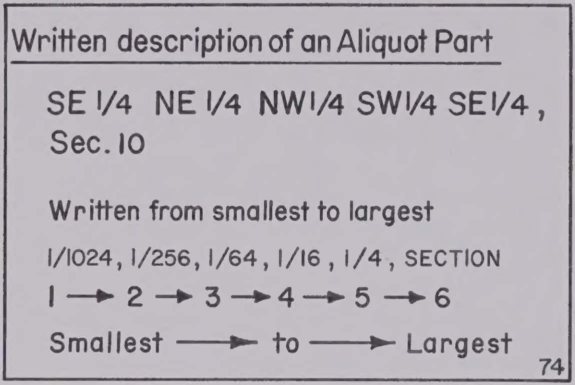


his one two fifty-sixths unit is described as the Southwest quarter of the orthwest quarter of the northeast quarter, section 10, Township (XX), Range (YY),(Meridian,)and State.





This one thousand twenty-fourth unit is the NE 1/4 SE 1/4 NW 1/4 SE 1/4 NW 1/4, sec. 10, T. , R. , Mer. , State.



Written description of an Aliquot Part

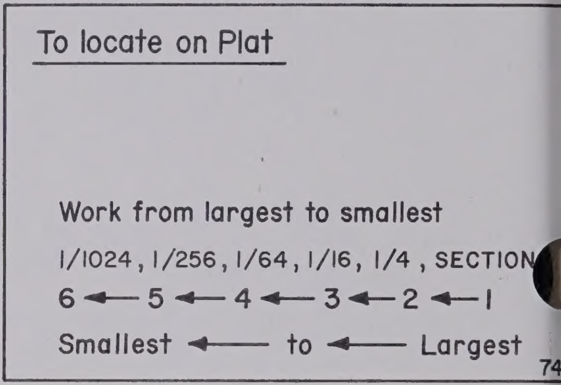
SE 1/4 NE 1/4 NW 1/4 SW 1/4 SE 1/4, Sec. 10

Written from smallest to largest

1/1024, 1/256, 1/64, 1/16, 1/4, SECTION

1 → 2 → 3 → 4 → 5 → 6

Smallest → to → Largest



To locate on Plat

Work from largest to smallest

1/1024, 1/256, 1/64, 1/16, 1/4, SECTION

6 ← 5 ← 4 ← 3 ← 2 ← 1

Smallest ← to ← Largest

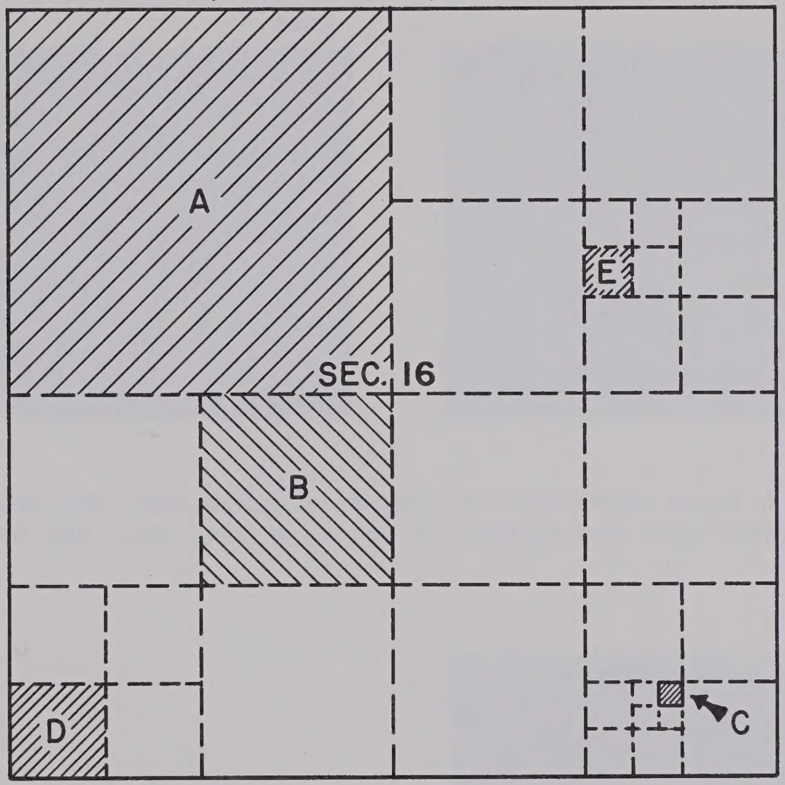
To locate an aliquot part on a plat, reverse the order of the written description.

Exercise No. 5

1) A regular section can be subdivided into 1024 aliquot parts.
TRUE or FALSE

2) From the diagram below, identify the unit of subdivision and write a complete description for: A, B, C, D, E. (use any abbreviation you desire)

TOWNSHIP 23 NORTH, RANGE 17 WEST, PRINCIPAL MERIDIAN, MONTANA



Area	Unit of subdivision	Description
A		
B		
C		
D		
E		

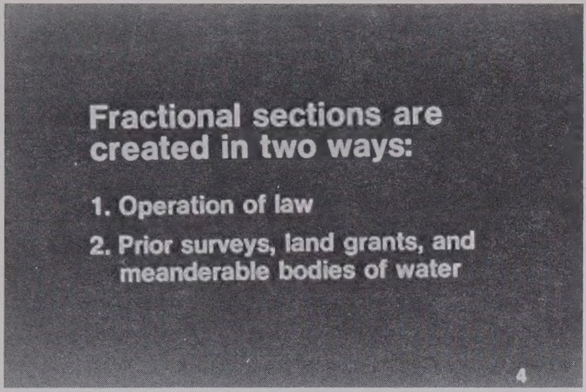
Answers to Exercise No. 5

1) TRUE

2)

AREA	UNIT OF SUBDIVISION	DESCRIPTION
A	1/4	NW 1/4 SEC. 16 T. 23 N., R. 17 W, Principal Mer., Mont.
B	1/16	NE 1/4 SW 1/4 SEC. 16. T. 23 N., R. 17 W., Principal Mer., Mont.
C	$\frac{1}{1024}$	NE 1/4 NE 1/4 SW 1/4 SE 1/4 SE 1/4 SEC. 16, T. 23 N., R. 17 W., Principal Mer., Mont.
D	$\frac{1}{64}$	SW 1/4 SW 1/4 SW 1/4 SEC. 16 T. 23 N., R. 17 W., Principal Mer., Mont.
E	$\frac{1}{256}$	SW 1/4 NW 1/4 SE 1/4 NE 1/4 SEC. 16 T. 23 N., R. 17 W., Principal Mer., Mont.

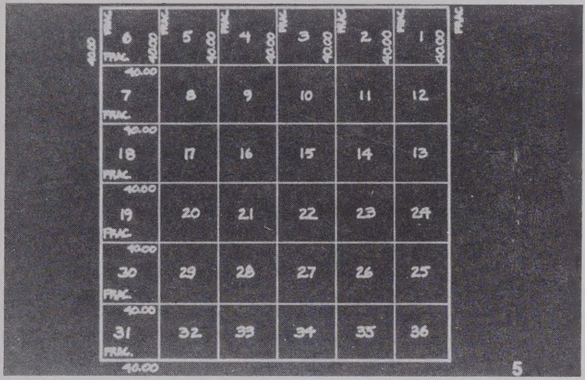
REEL THREE

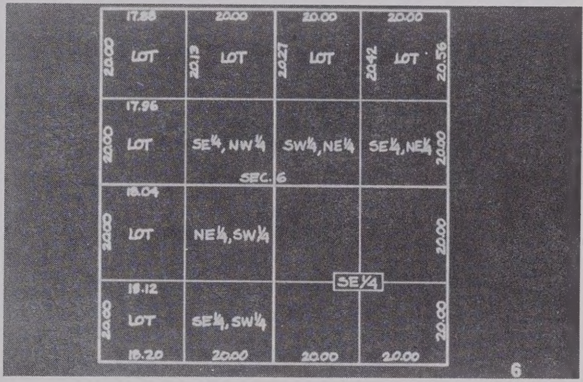


Fractional sections are created in two ways:

1. Operation of law
2. Prior surveys, land grants, and meanderable bodies of water

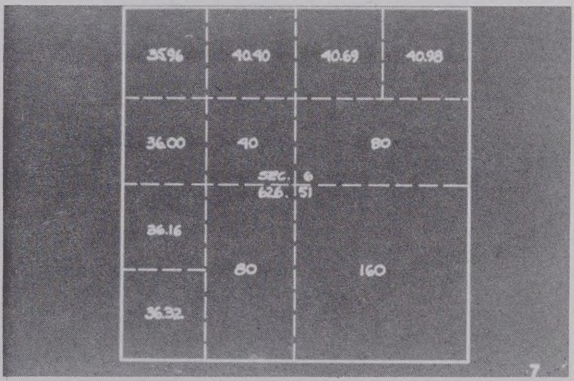
Fractional sections (those sections which contain lots) have two origins.

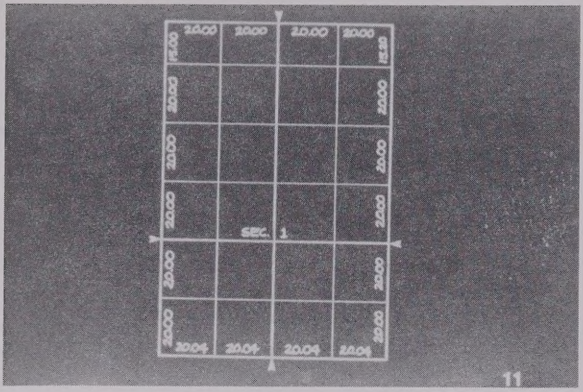


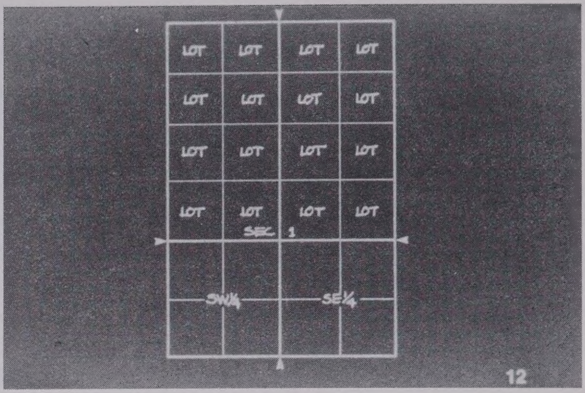


The law requires that the original survey of townships place fractional measurements in the last half miles of the north and west tiers of sections.

The units encompassed by the fractional measurements are designated as lots since they are not actually aliquot parts.

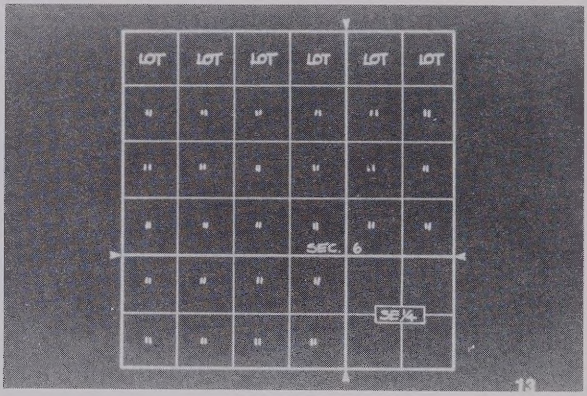


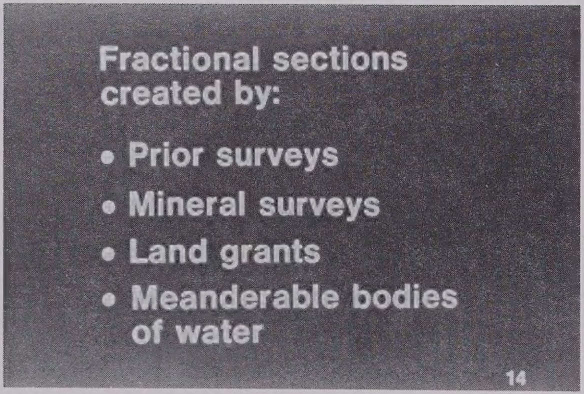




By definition, an elongated section is a fractional section which requires two or more tiers of lots.

An elongation of section can occur in two directions.



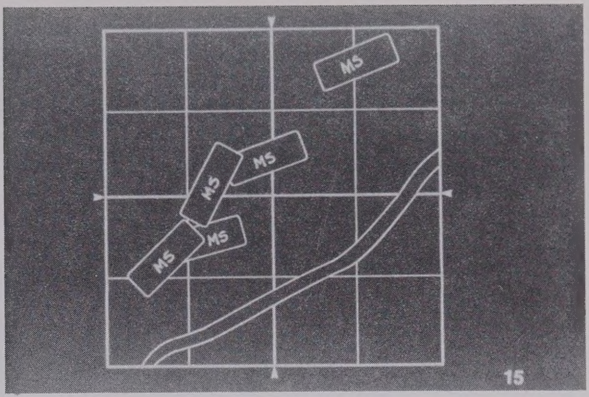


Fractional sections created by:

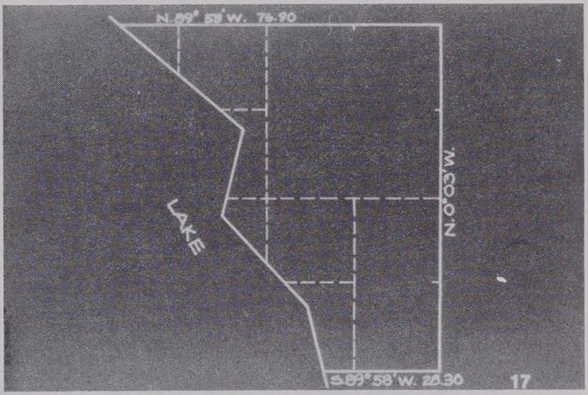
- Prior surveys
- Mineral surveys
- Land grants
- Meanderable bodies of water

Fractional sections are also created by the influence of other surveys and terrain features.

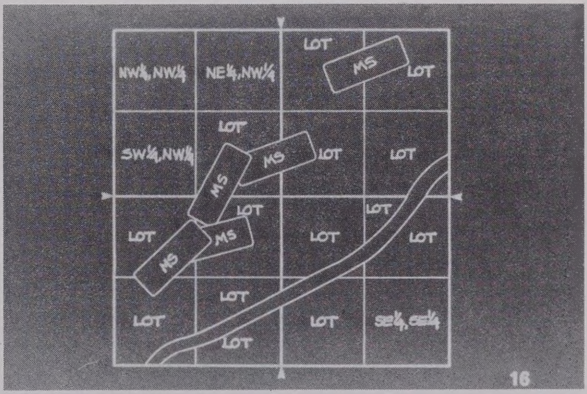
The subdivision of section lines of fractional sections are controlled by opposite corresponding corners when such corners are, or can be, established.

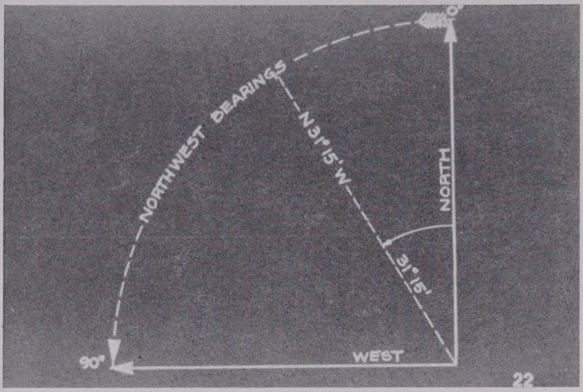


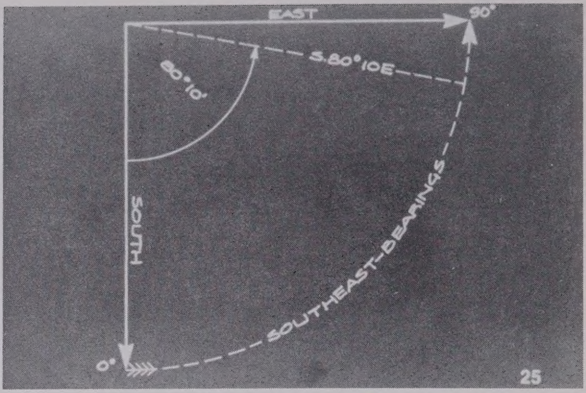
When the opposite corresponding corner condition is not possible, the subdivision of section lines are established on mean bearings, or parallel to a controlling line.



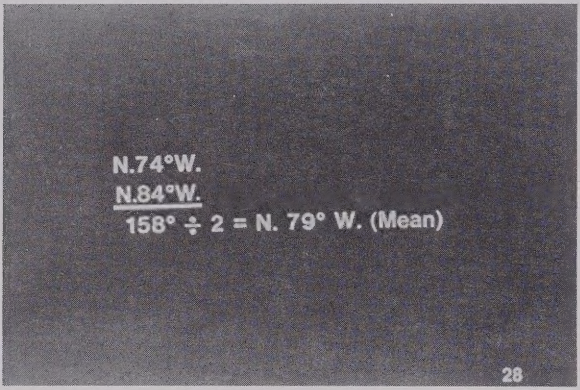
In either case, lots are created by the termination of the subdivision of section lines at limiting boundaries.





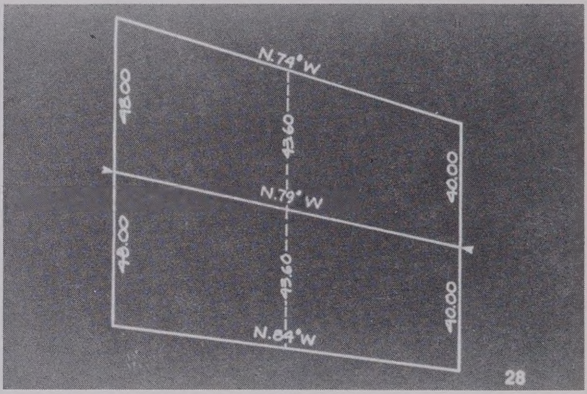


In cadastral survey useage, bearings (or courses) are oriented either from north or south.

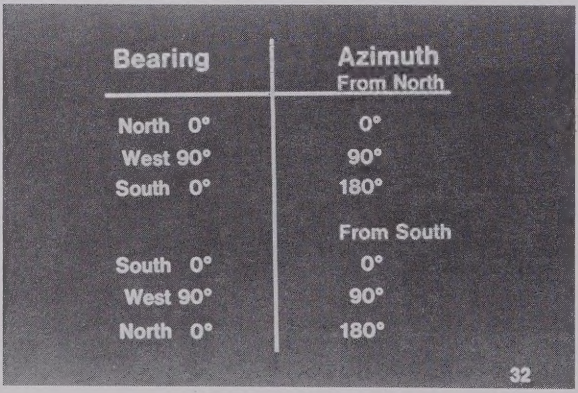

N.74°W.

N.84°W.

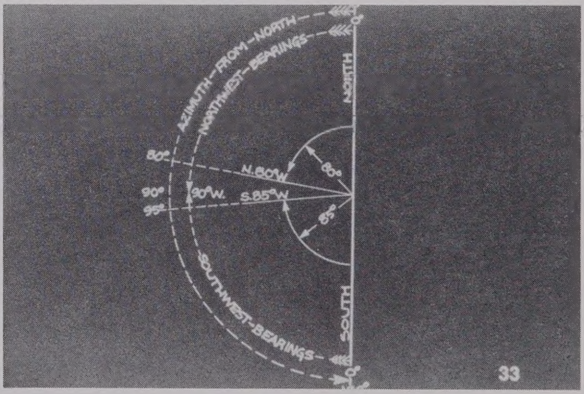
158° ÷ 2 = N. 79° W. (Mean)



To determine the mean between two bearings when both are in the same quadrant, add the two bearings together and divide by two.

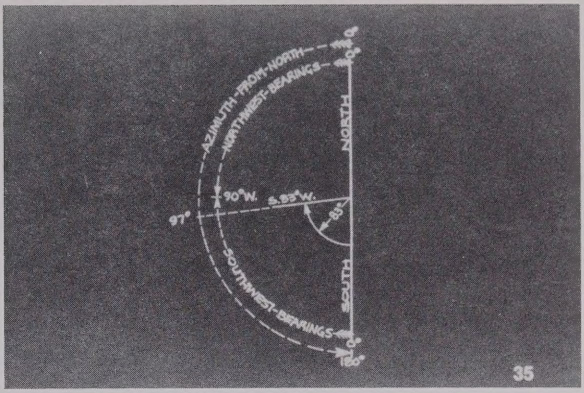


Bearing	Azimuth From North
North 0°	0°
West 90°	90°
South 0°	180°
	From South
South 0°	0°
West 90°	90°
North 0°	180°

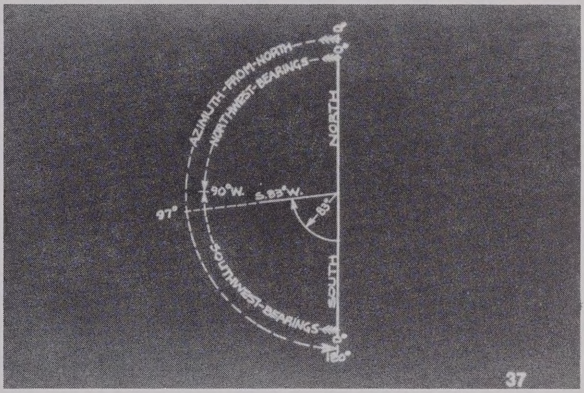


When bearings are in adjacent north-south quadrants, the azimuth method to determine a mean can be used by converting the bearings to a 180 degree basis. Mathematical custom dictates that Azimuths are measured (counted) clockwise from a reference meridian which is usally North.

After converting, add the two azimuths together, divide by two, and convert back to the cardinal direction bearing (from north or south).



To find bearings in adjacent east-west quadrants, compute an algebraic sum and divide by two. The new direction is determined by the sign of the answer.



Exercise No. 6

1) Fractional sections are those sections which, when platted, are shown as containing lots. Why do fractional sections occur?

2) By the above definition of fractional sections, can a fractional section contain more than the standard 640 acres?

3) Determine the mean bearing of the following sets of bearings:

A. S. 33^{o} 16' E.
S. 45^{o} 58' E.

B. N. 87^{o} 38' E.
S. 52^{o} 26' E.

C. N. 0^{o} 01' W.
N. 0^{o} 07' E.

D. S. 45^{o} W.
N. 45^{o} W.

E. N. 0^{o} 07' W.
N. 0^{o} 01' W.

4) In fractional sections where corresponding corners are established, the subdivision of section lines are controlled by the corresponding corners, even though the lines are not continuous through segregated entities.

Now, describe the method for controlling subdivision of section lines when corresponding corners have not or cannot be established.

What is an elongated section?

Answers to Exercise No. 6

1) Fractional sections are created because they are required by law (west and north tiers of townships), or because prior surveys, other land segregations, or significant bodies of water affect the sixteenth unit of a section.

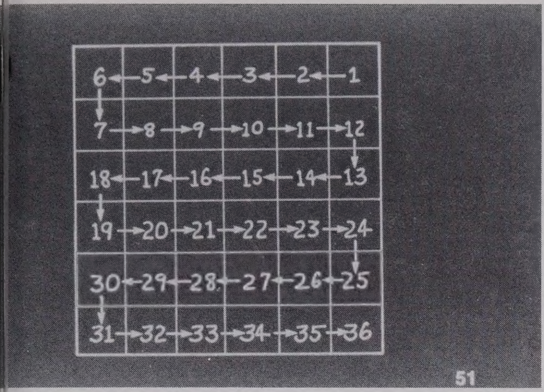
2) Yes

3) A. S.39° 37' E.
B. S.72° 24' E.
C. N. 0° 03' E.
D. West
E. N. 0° 04' W.

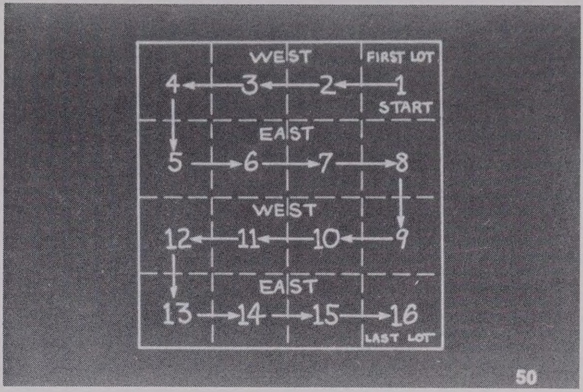
4) By law, the subdivision of section line is run on a cardinal direction from an established corner to the particular terminating boundary.

However, the law is interpreted to permit, according to judgement, the establishment of subdivision of section lines on mean bearings, or, alternatively, parallel to the appropriate section boundary.

5) An elongated section is a fractional section in which either the length or width exceeds 80 chains to such an extent as to require two or more tiers of lots.

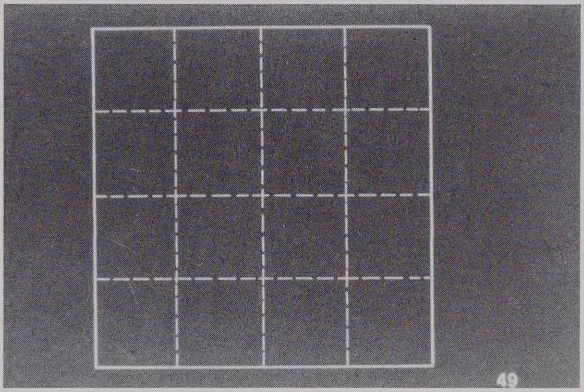


51



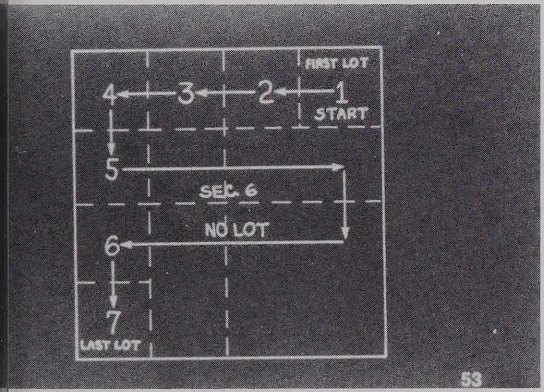
50

ot numbering follows the same plan as township section numbering.

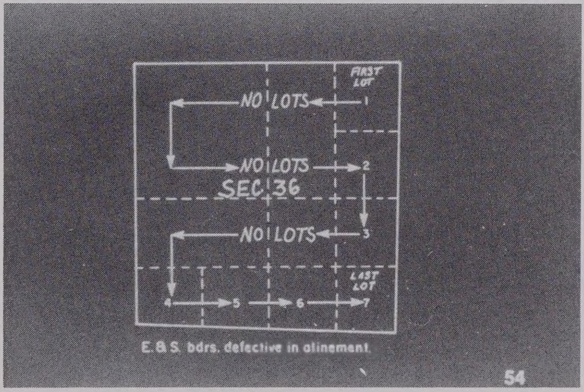


49

ach section is considered on an
pproximate sixteenth unit plan.



53

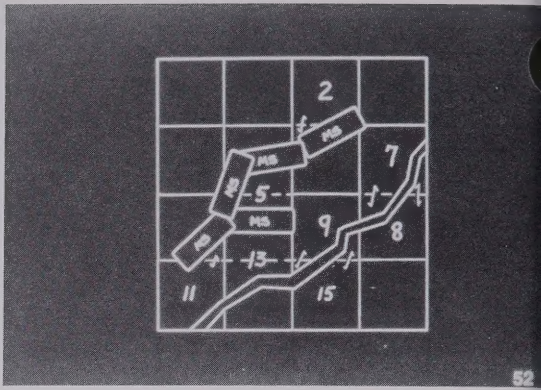


E. & S. bdrs. defective in alinement.

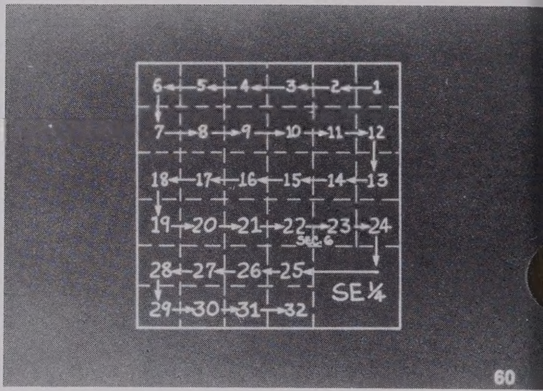
54

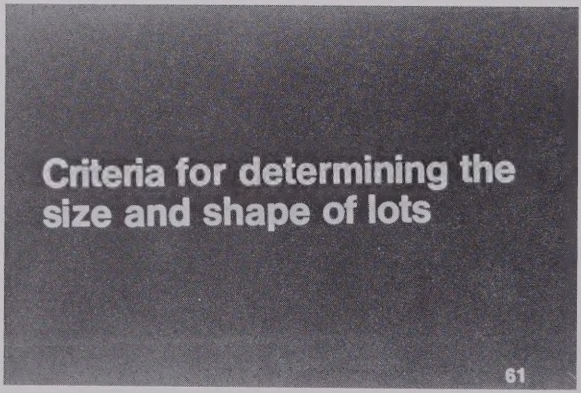
e standard direction for each sixteenth tier is maintained even though
particular tier has no lots.

According to certain conditions and judgement, a lot may be extended into another tier.



Elongated sections have a similar numbering pattern.

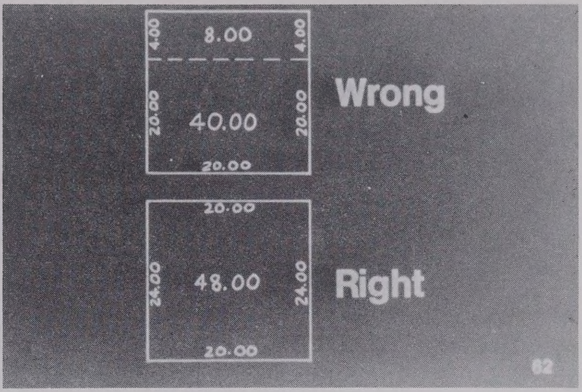




Criteria for determining the size and shape of lots

The general goal is to lot sectio on a plan which maximizes aliquot parts, but not to the extent of forming distorted sizes or shapes

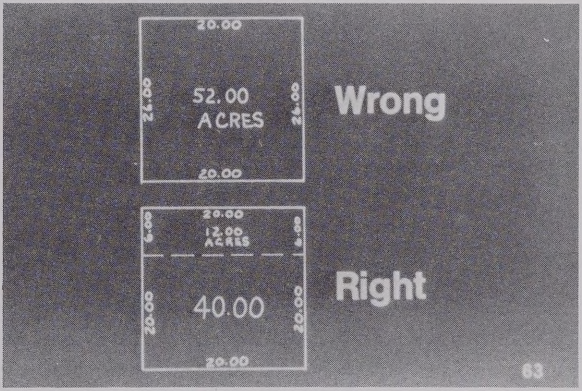
void lots of less than 10 acres
hen one dimension has a normal
idth.



Wrong

Right

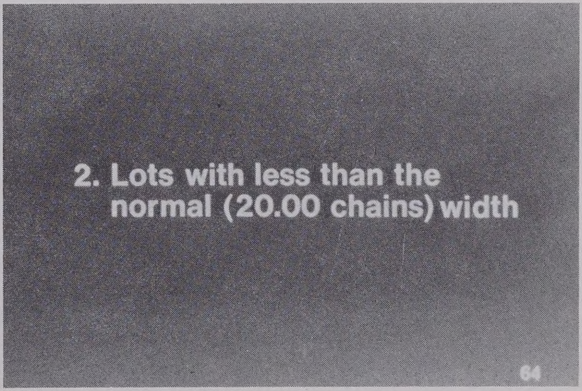
r these normal width lots, try
keep the area between 10 and
acres.



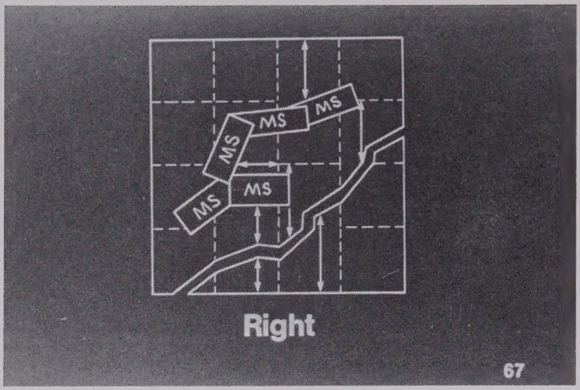
Wrong

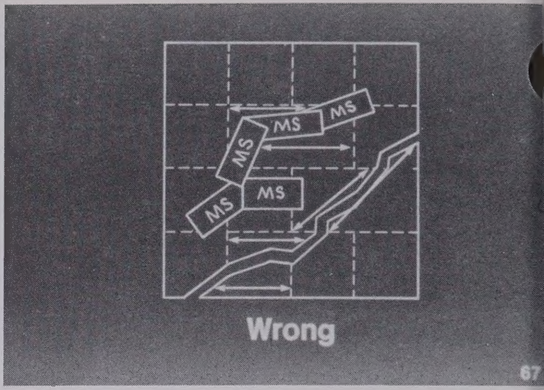
Right

mpact lots should be held to a
nge of 5 to 45 acres.



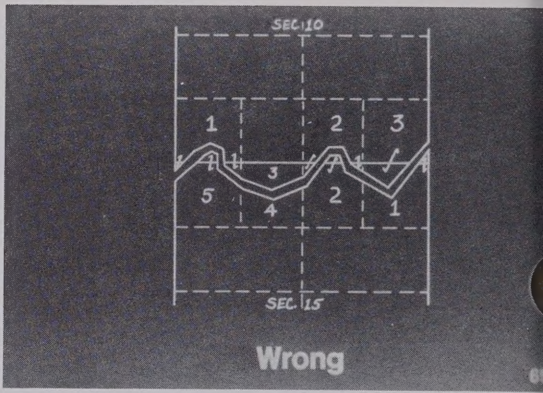
2. Lots with less than the
normal (20.00 chains) width

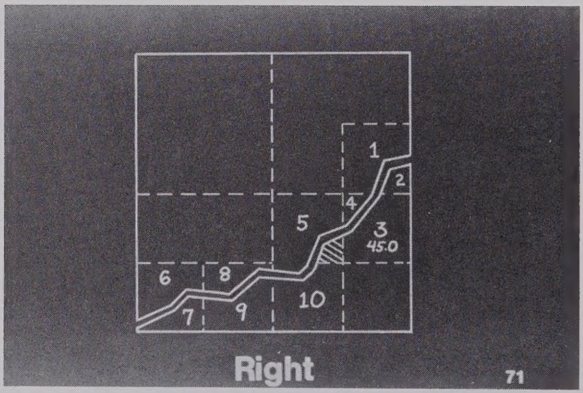


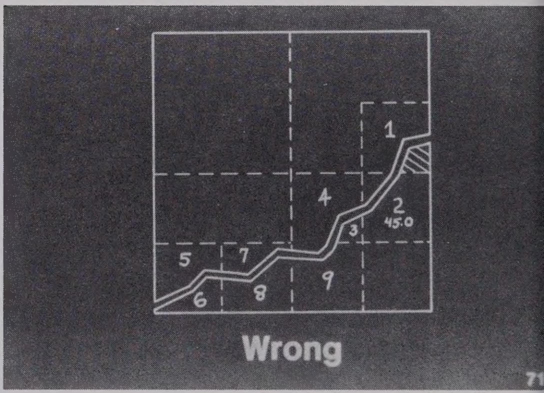


Lots with extreme lengths or narrow widths should not be formed.

Do not extend lots across section lines.







If feasible, do not extend lots from one into another fractional quarter section.

Exercise No. 7

) The term "lot", as used in cadastral surveying terms, indicates an area which crosses section lines. TRUE or FALSE

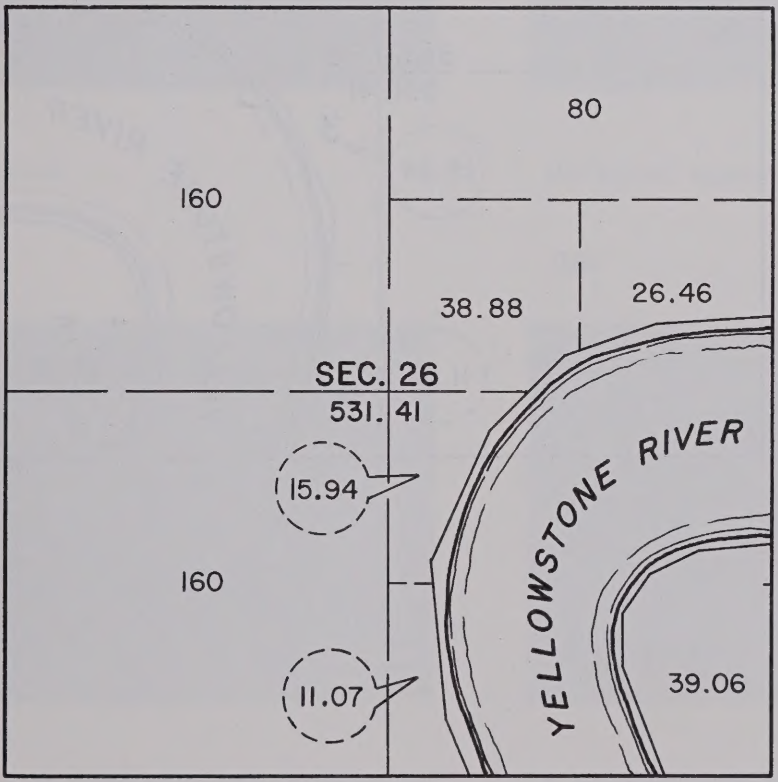
) In lotting cadastral survey plats, the value of the land involved is a prime consideration. TRUE or FALSE

) Ideally, fractional sections are subdivided by a plan which will contain as many aliquot parts as possible. TRUE or FALSE

) When forming fractional lots along irregular boundaries, where both line lengths are considerably less than 20 chains, lots of less than 5 acres or more than 45 acres are not desireable. TRUE or FALSE

) In forming fractional lots having a normal width of 20 chains, it is desireable to keep the lots within a range of 20 to 50 acres. TRUE or FALSE

) On the following diagram, number the indicated lots as they would be shown on the plat.



Answers to Exercise No. 7

1) FALSE. Lottings should never cross section lines.

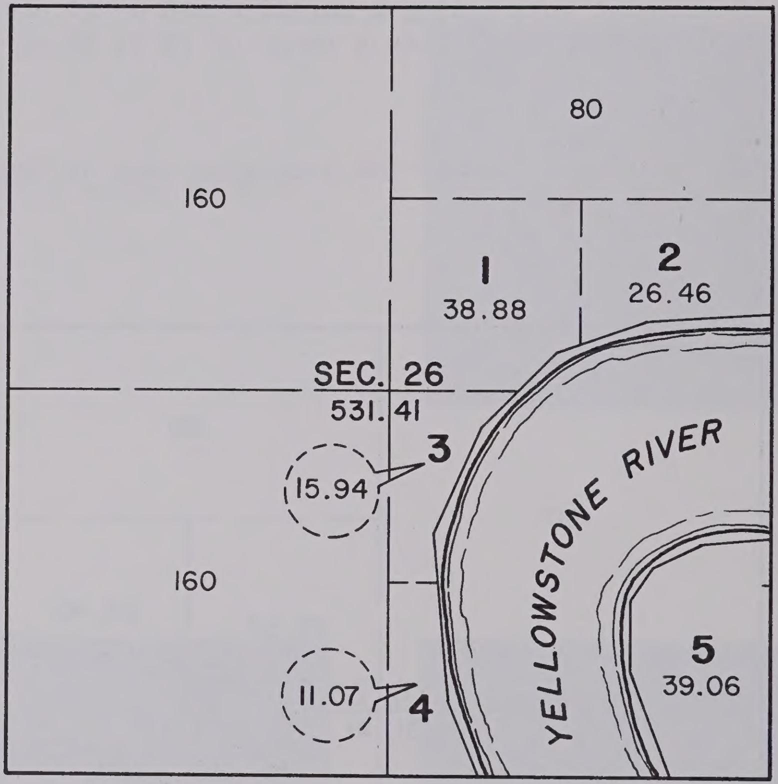
2) FALSE

3) TRUE

4) TRUE

5) FALSE. 10 to 50 acres.

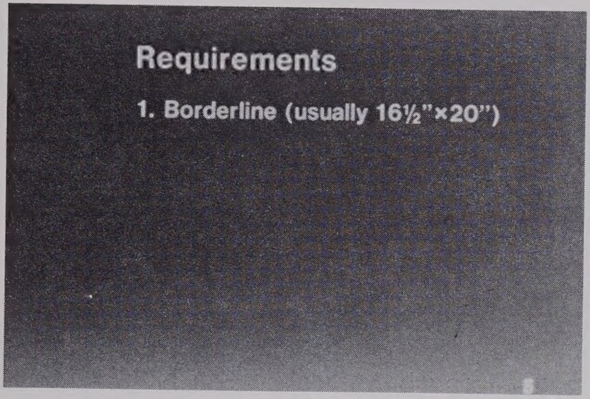
6)



REEL FOUR

There are eleven items required in the construction of all cadastral survey plats.

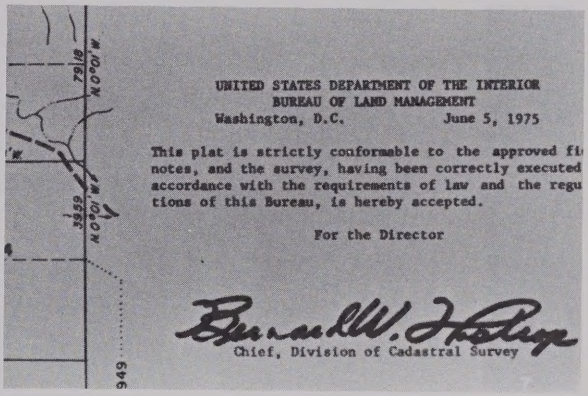
Every Plat must have:



Requirements

1. Borderline (usually 16½"×20")

A borderline



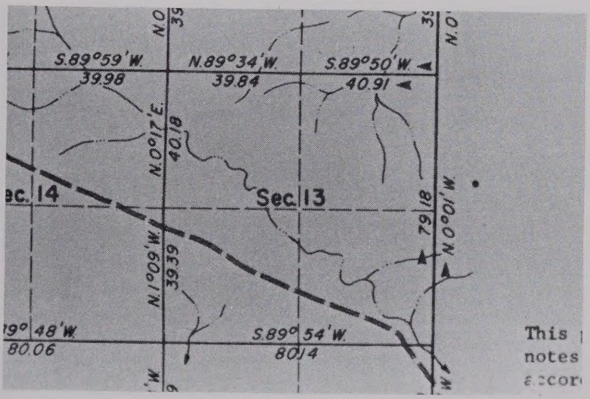
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Washington, D.C. June 5, 1975

This plat is strictly conformable to the approved fi notes, and the survey, having been correctly executed accordance with the requirements of law and the regu tions of this Bureau, is hereby accepted.

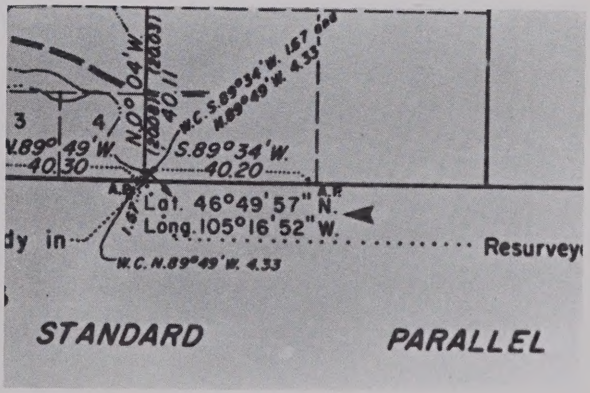
For the Director

Chief, Division of Cadastral Survey

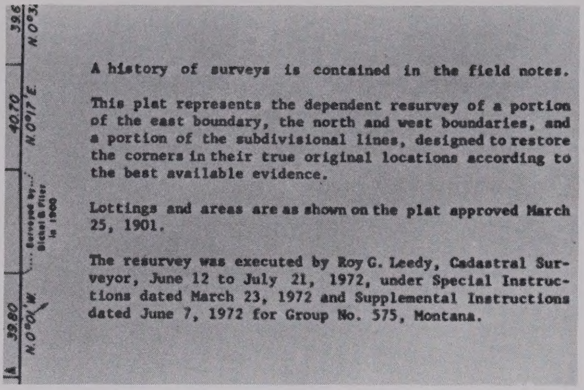
Official approval



With some exceptions, the direction and length of every line



A stated latitude and longitude



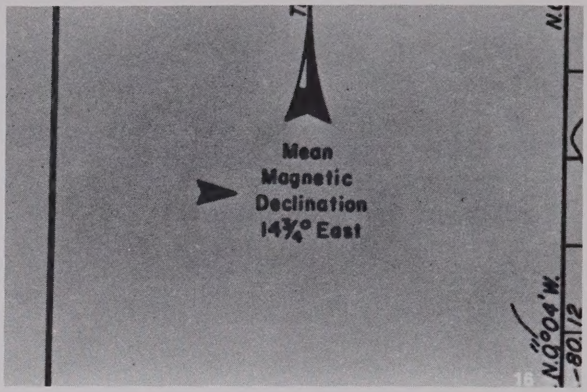
A history of surveys is contained in the field notes.

This plat represents the dependent resurvey of a portion of the east boundary, the north and west boundaries, and a portion of the subdivisional lines, designed to restore the corners in their true original locations according to the best available evidence.

Lottings and areas are as shown on the plat approved March 25, 1901.

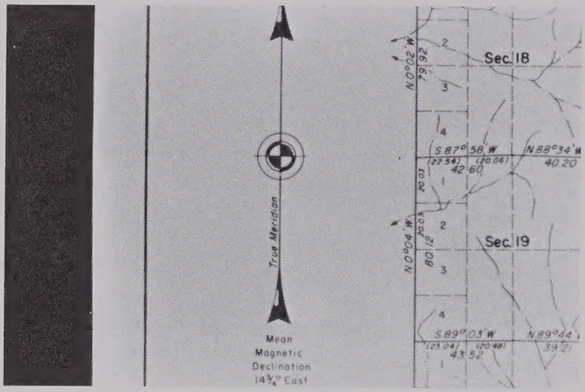
The resurvey was executed by Roy G. Leedy, Cadastral Surveyor, June 12 to July 21, 1972, under Special Instructions dated March 23, 1972 and Supplemental Instructions dated June 7, 1972 for Group No. 575, Montana.

A memorandum of authority

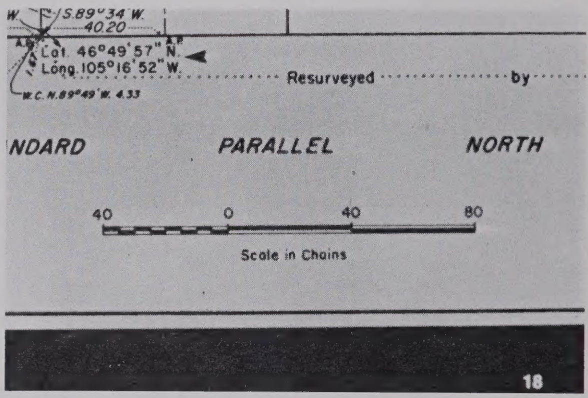


A statement of mean magnetic declination

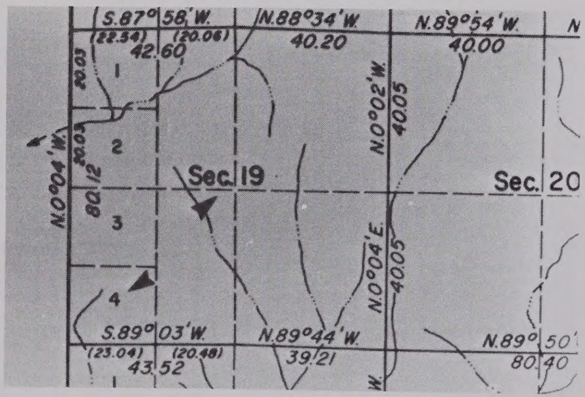
Note: Subsisting surveys are those original and subsequent surveys which are pertinent to the survey being executed.



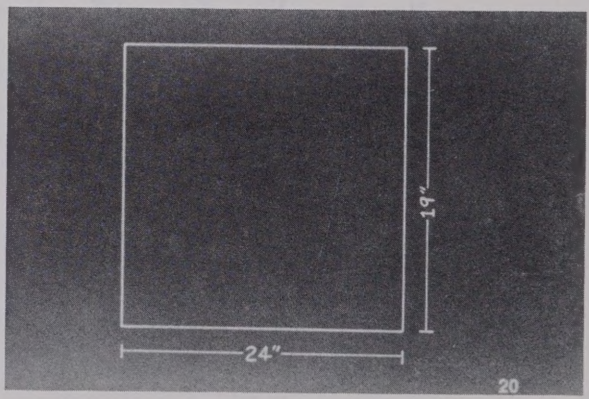
A north arrow



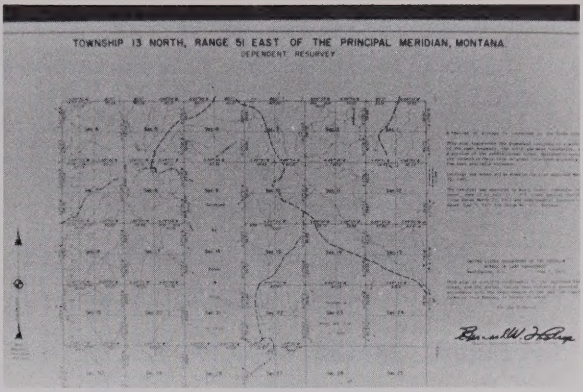
A scale



Identification of areas surveyed

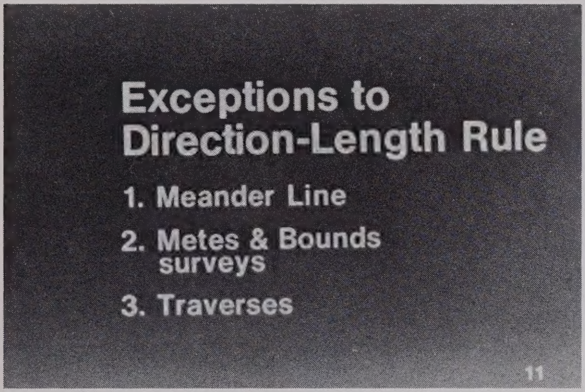


A standard-sized plat sheet



TOWNSHIP 13 NORTH, RANGE 51 EAST OF THE PRINCIPAL MERIDIAN, MONTANA
DEPENDENT RESURVEY

A title



Exceptions to Direction-Length Rule

1. Meander Line
2. Metes & Bounds surveys
3. Traverses

The three exceptions to showing the direction and length of all lines do not include subdivisional lines

Exercise No. 8

There are 11 items required in the construction of all cadastral survey plats. Match these 11 items given in the left column with the appropriate statement given in the right column.

1. borderline
2. certificate of acceptance
3. direction and length of every line surveyed
4. geographic position
5. memorandum of authority
6. mean magnetic declination
7. north arrow
8. bar or graphic scale
9. surveyed areas identification
10. sheet size
11. title

a) indicates true meridian

b) three exceptions

c) often related to the cadastral grid

d) may be varied slightly when necessary

e) correlation and consolidation of the record of all surveys shows on the particular plat

f) official approval

g) latitude and longitude

h) shown under north arrow

i) shows unit of measurement

j) section number, aliquot part, lot number, tract number, mineral survey number, etc.

k) no variation

Answers to Exercise No. 8

1) d

2) f

3) b

4) g

5) e

6) h

7) a

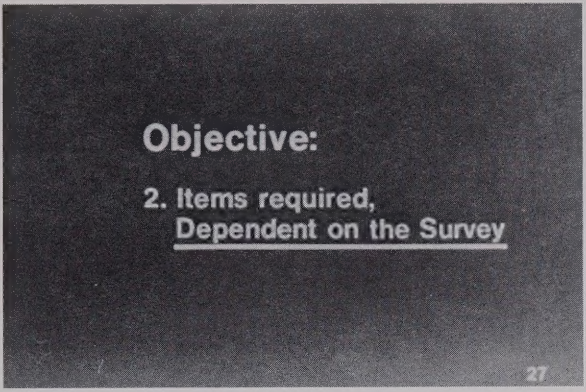
8) i

9) j

10) k

11) c

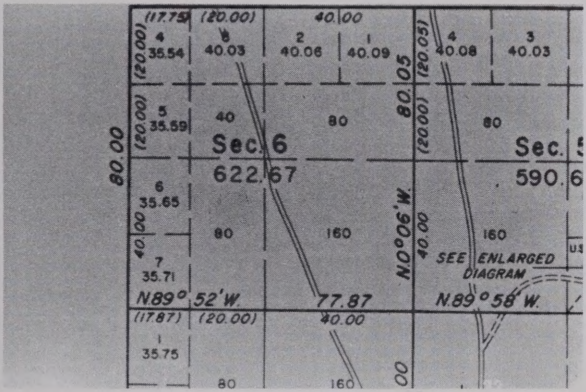
More Plat Requirements, Dependent on the Particular Survey

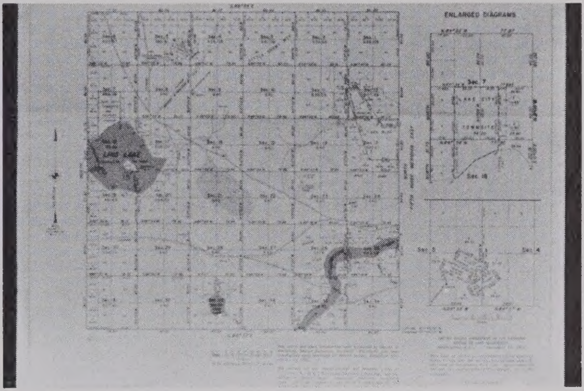


Objective:

2. Items required, Dependent on the Survey

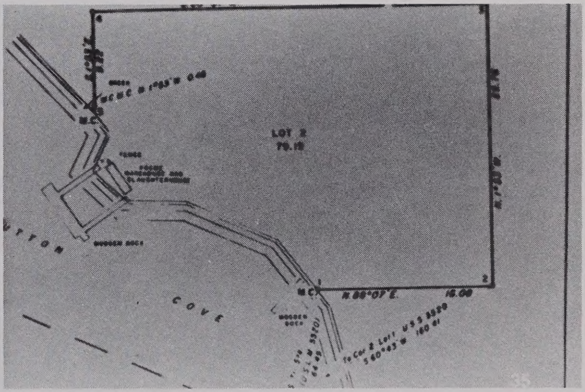
Some additional plat requirements depend on the type of survey.

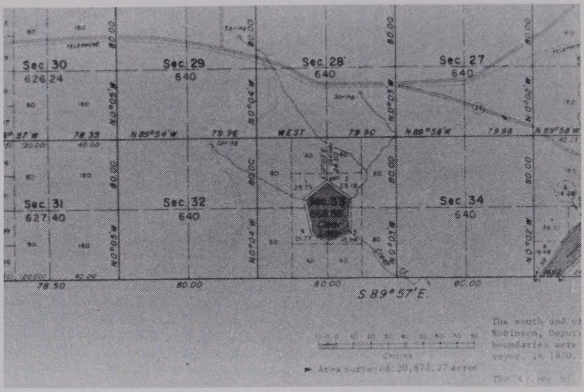




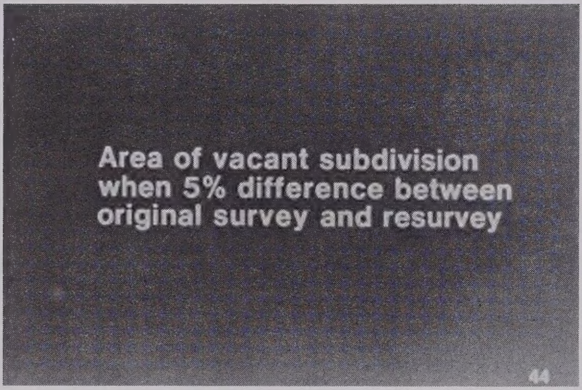
A plat which delineates boundaries for the first time must show areas of sections and lots to the nearest one-hundredth acre.

Original plats of some types of metes and bounds surveys must also show areas.



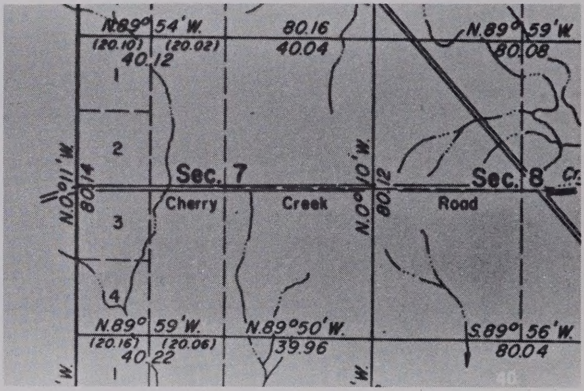


A plat of an original survey also contains a note of total acres surveyed.

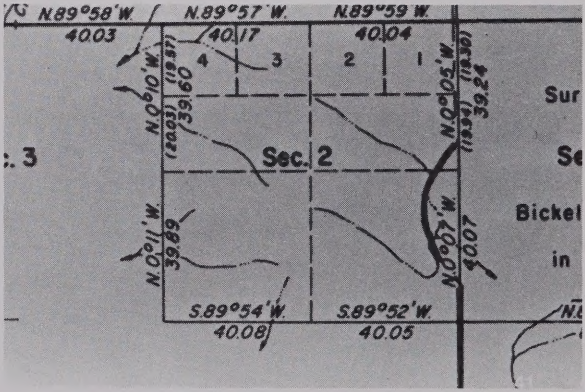


Area of vacant subdivision when 5% difference between original survey and resurvey

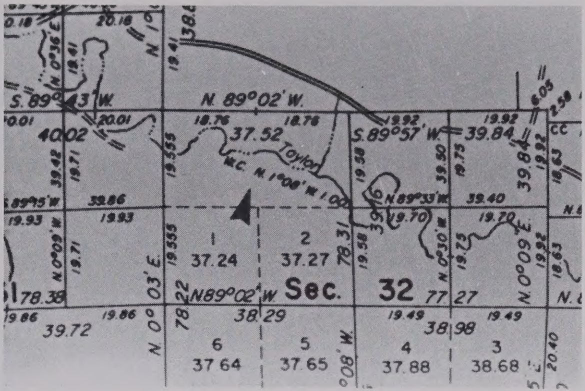
44



Dependent resurvey plats do not show lot areas,

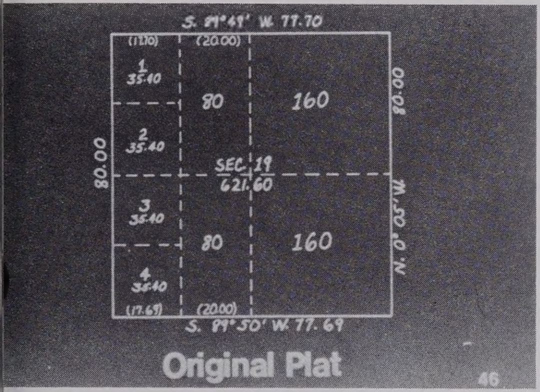


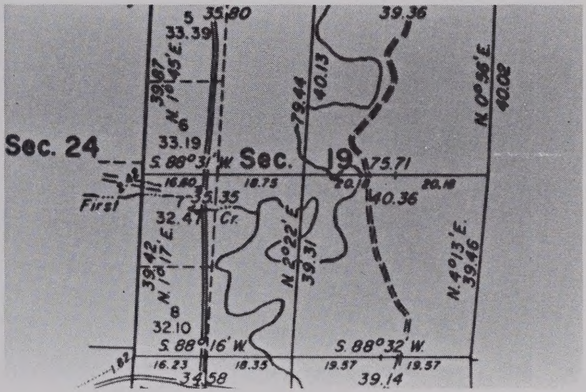
unless there is revision of the original lot areas or aliquot part one - sixteenth units.



wever, patented lands are never
vised.

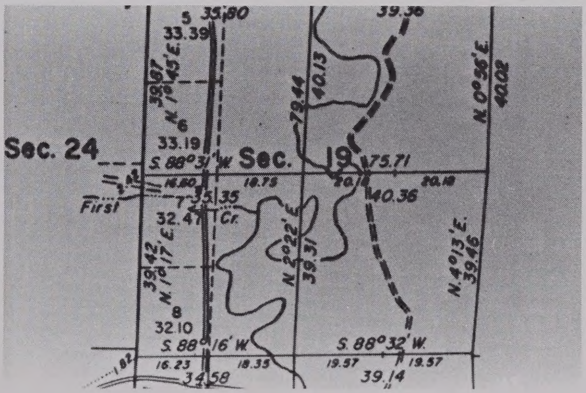
te: Patented lands are those
nds which have been conveyed by
e United States through legal ti-
e to named entities; alienated
nds are those lands which have
en transferred by legal conveyance to another party. In BLM usage, alienated
nds are synonymous with patented lands.

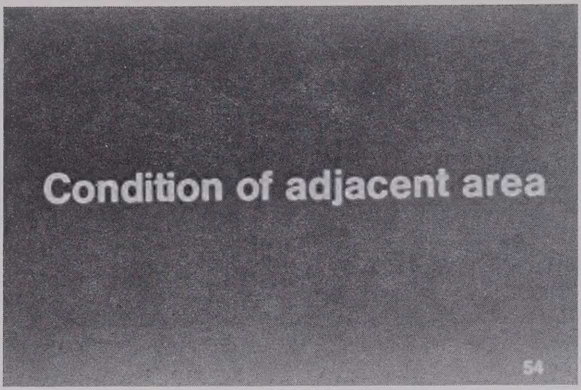




en areas are revised, a new lot number is assigned.

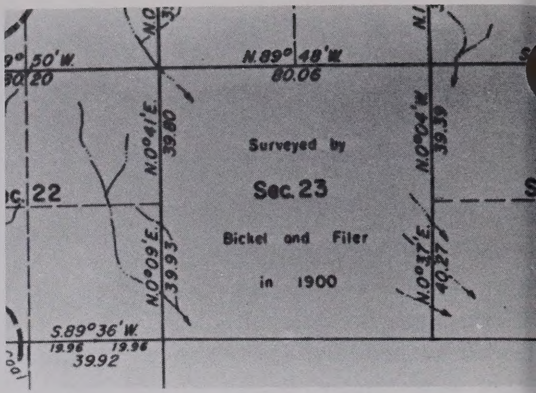
tice that a new section acreage
not given.



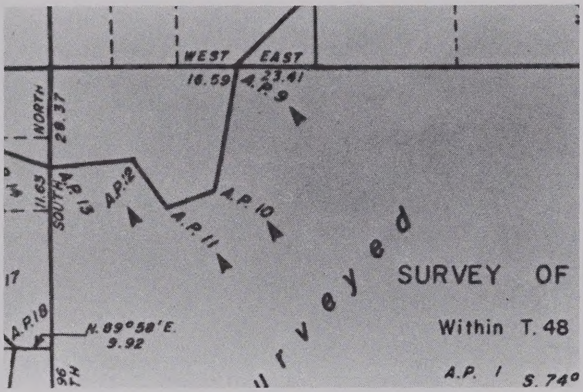


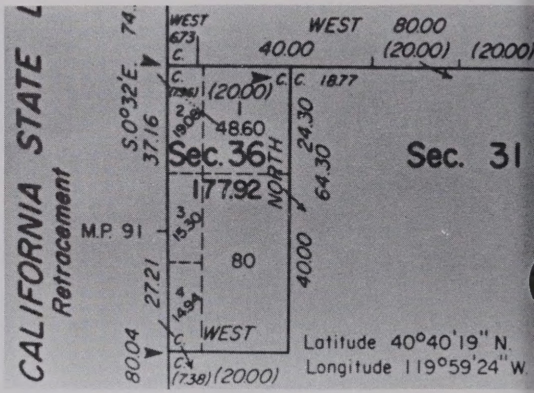
Condition of adjacent area

54



When only a portion of a township is resurveyed, the status of the adjacen areas is shown.





For some surveys, certain types of corners are identified by abbreviations on the plat.

Note: For additional study on corner monument abbreviations, see Chapter of the 1973 Manual of Surveying Instructions .

Exercise No. 9

A cadastral survey determines ______________ as well as defining the boundaries of land.

Tracts delineated on original survey plats must have areas shown.
TRUE or FALSE

The total area surveyed is always shown on (original, resurvey) plats.

The showing of areas on plats of dependent resurveys has several unique aspects. Strike out the phrases below which do not apply.

a) areas within regular sections are not shown

b) a marginal note stating the number of acres covered is required

c) patented lands are not revised

d) vacant subdivision areas are revised when there is a ten percent change from the original plat

e) when revised, lots are re-numbered with the next higher number than was on the immediately preceding plat, and also show the new area

Areas adjacent to resurveyed areas should contain explanatory notes on the plat. TRUE or FALSE

Name five of the types of corners which must be shown on the plat if they are part of a survey.

Answers to Exercise No. 9

1) areas

2) TRUE

3) original

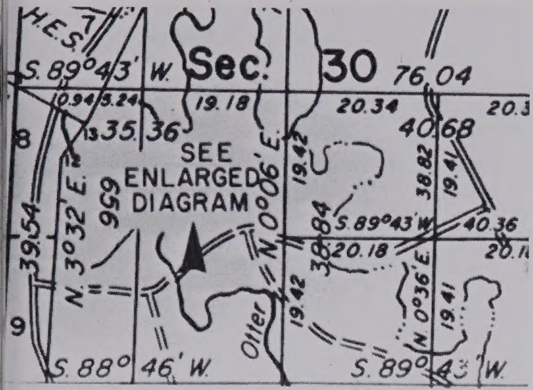
4) Strike: b), d) vacant subdivision areas are revised when there is a five per cent change, although this requirement can b reduced, if needed, for management purposes.

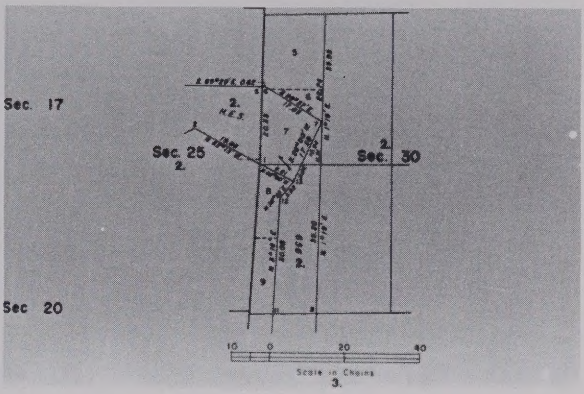
5) TRUE Terms such as "UNSURVEYED" or "SURVEYED BY .... IN 1930" can be used.

6) amended monument (AM)
angle point (A.P.)
auxiliary meander corner (A.M.C.)
closing corner or crossing closing corner (C.C.)
electronic control point monuments (EC)
U.S. Location Monuments (U.S.L.M.)
meander corner (M.C.)
metes and bounds corners
mineral survey corners
mile corners and half mile corners
special meander corner (SMC)
witness corner (W.C.)

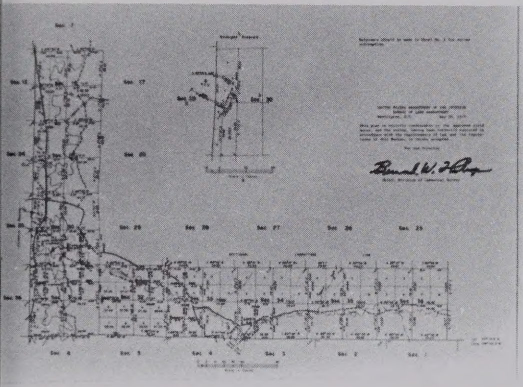
litional Required Plat Items Dependent on the Survey

EL FIVE



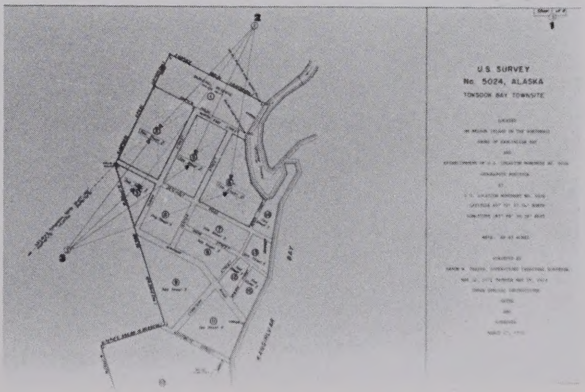


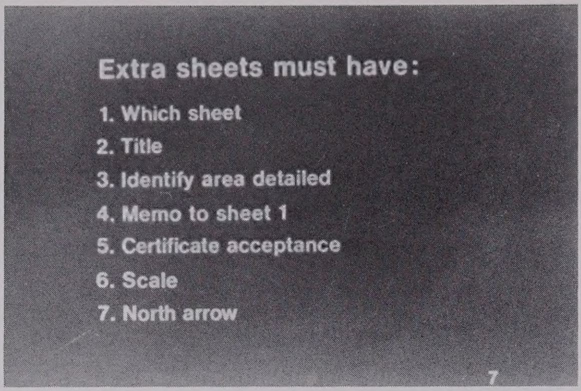
tails of a survey at the scale of the base plat may demand an enlarged agram.



When used, enlarged diagrams should be adequately referenced for title, location, and scale.

r some projects, additional eets may be the only way to equately portray the detail.

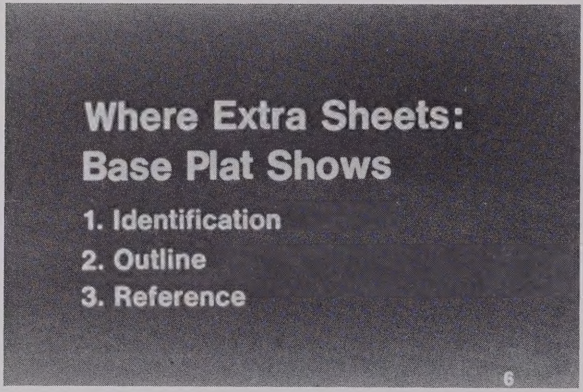




Extra sheets must have:

1. Which sheet
2. Title
3. Identify area detailed
4. Memo to sheet 1
5. Certificate acceptance
6. Scale
7. North arrow

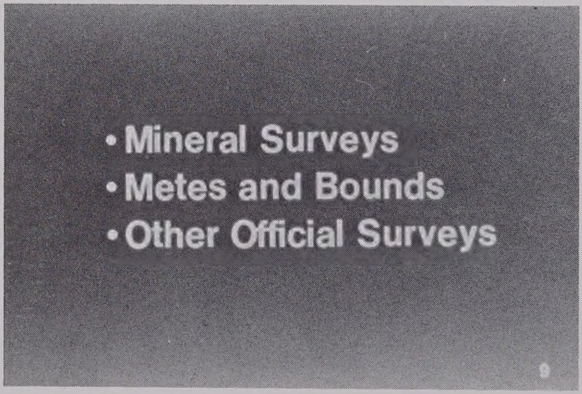
Extra sheets have certain labeli
requirements.



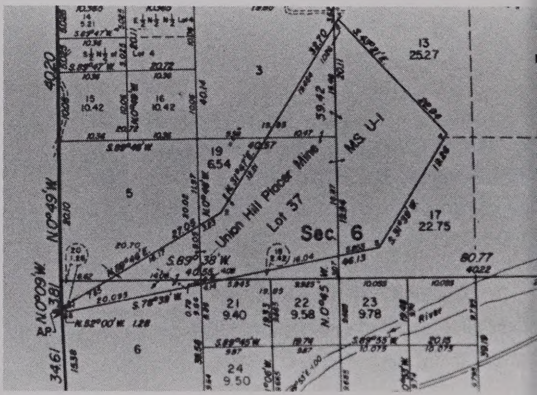
Where Extra Sheets: Base Plat Shows

1. Identification
2. Outline
3. Reference

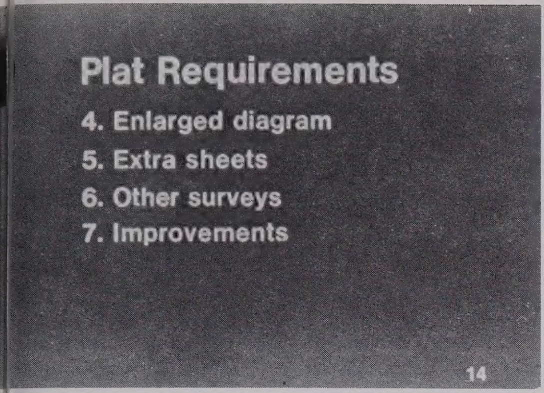
The base sheet (or sheet 1) also
has certain requirements.



- Mineral Surveys
- Metes and Bounds
- Other Official Surveys

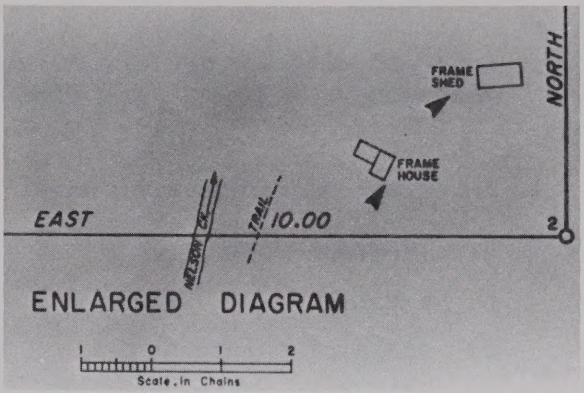


Metes and bounds types of surveys have special depiction criteria.

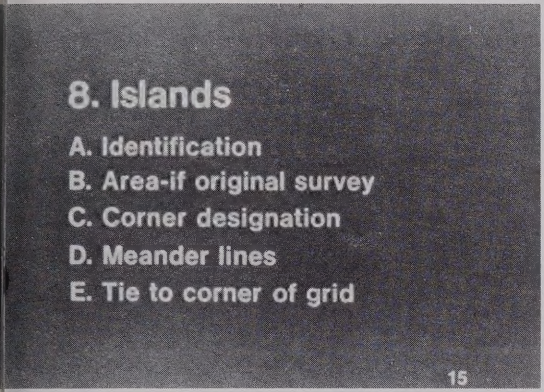


Plat Requirements

4. Enlarged diagram
5. Extra sheets
6. Other surveys
7. Improvements

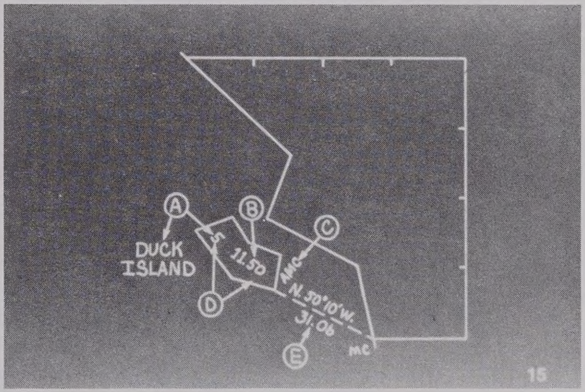


hen it is necessary to show physical improvements on the plat, both ymbols and labels are used.



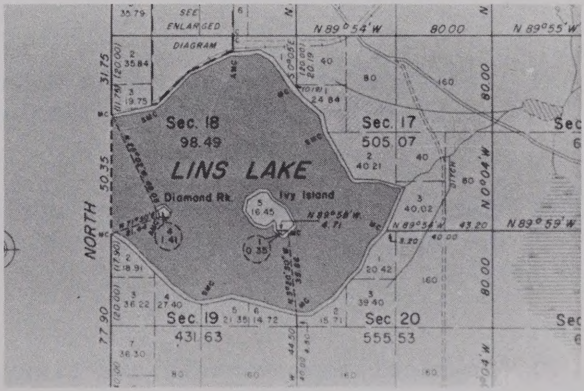
8. Islands

A. Identification
B. Area-if original survey
C. Corner designation
D. Meander lines
E. Tie to corner of grid



slands included in a survey have several definite depiction requirements.

he depiction of surveyed lakes
lso involves certain designations.



Exercise No. 10

1) Enlarged diagrams are always sufficient to represent the work of the survey. TRUE or FALSE

2) An enlarged diagram must have:

   a) location references

   b) a title

   c) scale of enlargement

   d) all of the above

   e) b and c, above

3) The base plat sheet of a set of cadastral plat sheets should:

   a) be given the highest sheet number

   b) contain an outline and identification of each area shown on the other sheets

   c) have a reference to the sheet where the data is found

   d) all of the above

   e) b and c, above

4) The additional sheets of a set of cadastral plat sheets should:

   a) be sequentially numbered and have the same title as the base plat

   b) identify the area detailed and have a memorandum referring to Sheet 1

   c) have a certificate of acceptance and a scale of the drawing

   d) have a north arrow and statement of mean magnetic declination

   e) all of the above

5) Cadastral plats containing mineral surveys, metes and bounds surveys, etc. (must, may) show boundaries adjacent to the public lands.

6) Corners of the survey, and official name or number designation must be shown for metes and bounds areas on cadastral survey plats. TRUE or FALSE

7) Physical improvements are always shown on enlarged diagrams. TRUE or FALSE

8) List three items which must be included in the depiction of an island which is part of a survey.

9. List three items which must be included in the depiction of a lake which is part of a survey.

Answers to Exercise No. 10

1) FALSE. Enlarged diagrams are used whenever possible; however, additional sheetbs may be the only reasonable alternative in showing the total survey in sufficient detail.

2) (d)

3) (e) The base plat is designated "Sheet 1 of ..... Sheets".

4) (e) NOTE: There is some variance among the various offices as to whether or not the magnetic declination is shown on each sheet.

5) must

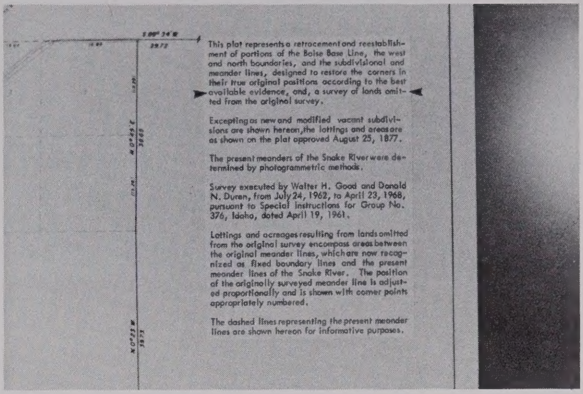
6) TRUE

7) FALSE. Enlarged diagrams may be necessary to adequately portray the improvement.

8) a) Identification by lot number and name, if named
   b) Area, if the subject is an original survey
   c) Corner designation
   d) Meander lines
   e) Tie to a monumented corner of the cadastral grid

9) a) Name of lake, if named
   b) Meander lines
   c) Corner designations and ties, if required

An appropriate memorandum will briefly give an overview of important relationships.



This plat represents a retracement and reestablishment of portions of the Boise Base Line, the west and north boundaries, and the subdivisional and meander lines, designed to restore the corners in their true original positions according to the best available evidence, and, a survey of lands omitted from the original survey.

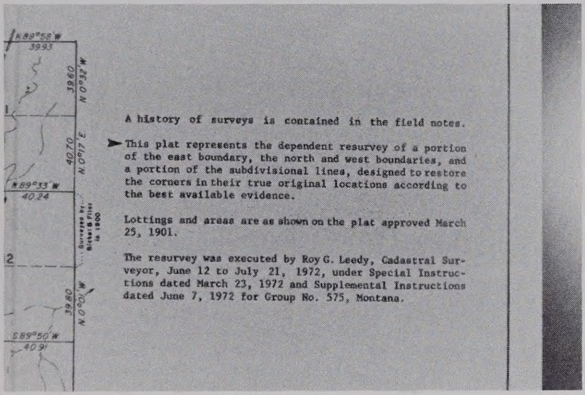
Excepting as new and modified vacant subdivisions are shown hereon, the lottings and areas are as shown on the plat approved August 25, 1877.

The present meanders of the Snake River were determined by photogrammetric methods.

Survey executed by Walter H. Good and Donald N. Duren, from July 24, 1962, to April 23, 1968, pursuant to Special Instructions for Group No. 376, Idaho, dated April 19, 1961.

Lottings and acreages resulting from lands omitted from the original survey encompass areas between the original meander lines, which are now recognized as fixed boundary lines and the present meander lines of the Snake River. The position of the originally surveyed meander line is adjusted proportionally and is shown with corner points appropriately numbered.

The dashed lines representing the present meander lines are shown hereon for informative purposes.

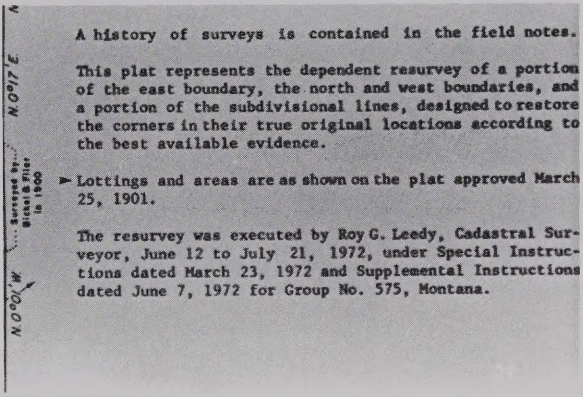

N89°58'W
39.93
N.0°32'W.
N.0°17'E.
N89°33'W
40.24
S.89°50'W
40.91
1
2

A history of surveys is contained in the field notes.

This plat represents the dependent resurvey of a portion of the east boundary, the north and west boundaries, and a portion of the subdivisional lines, designed to restore the corners in their true original locations according to the best available evidence.

Lottings and areas are as shown on the plat approved March 25, 1901.

The resurvey was executed by Roy G. Leedy, Cadastral Surveyor, June 12 to July 21, 1972, under Special Instructions dated March 23, 1972 and Supplemental Instructions dated June 7, 1972 for Group No. 575, Montana.


N.0°17'E.
Surveyed by... Bickel & Filer in 1900
N.0°01'W.

A history of surveys is contained in the field notes.

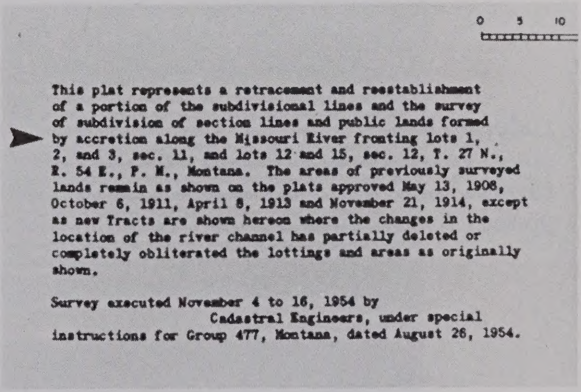
This plat represents the dependent resurvey of a portion of the east boundary, the north and west boundaries, and a portion of the subdivisional lines, designed to restore the corners in their true original locations according to the best available evidence.

Lottings and areas are as shown on the plat approved March 25, 1901.

The resurvey was executed by Roy G. Leedy, Cadastral Surveyor, June 12 to July 21, 1972, under Special Instructions dated March 23, 1972 and Supplemental Instructions dated June 7, 1972 for Group No. 575, Montana.

Dependent resurvey plat memorandums have two main items in addition to the usual data.

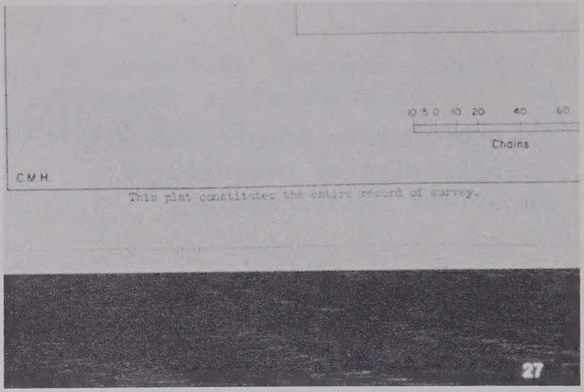
Special surveys may require unique plat memorandum statements.



This plat represents a retracement and reestablishment of a portion of the subdivisional lines and the survey of subdivision of section lines and public lands formed by accretion along the Missouri River fronting lots 1, 2, and 3, sec. 11, and lots 12 and 15, sec. 12, T. 27 N., R. 54 E., P. M., Montana. The areas of previously surveyed lands remain as shown on the plats approved May 13, 1908, October 6, 1911, April 8, 1913 and November 21, 1914, except as new Tracts are shown hereon where the changes in the location of the river channel has partially deleted or completely obliterated the lottings and areas as originally shown.

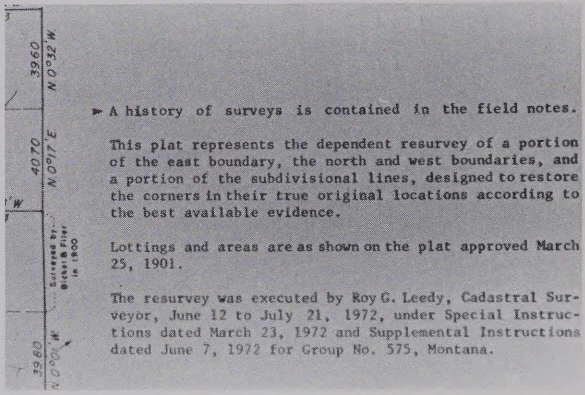
Survey executed November 4 to 16, 1954 by
Cadastral Engineers, under special
instructions for Group 477, Montana, dated August 26, 1954.

When the field notes are contained on the plat, the plat will incorporate a statement to that effect.



This plat constitutes the entire record of survey.

When appropriate, the plat will refer to a history of prior surveys.



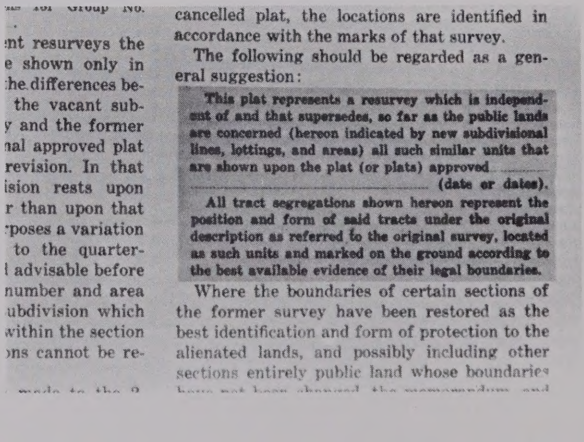
► A history of surveys is contained in the field notes.

This plat represents the dependent resurvey of a portion of the east boundary, the north and west boundaries, and a portion of the subdivisional lines, designed to restore the corners in their true original locations according to the best available evidence.

Lottings and areas are as shown on the plat approved March 25, 1901.

The resurvey was executed by Roy G. Leedy, Cadastral Surveyor, June 12 to July 21, 1972, under Special Instructions dated March 23, 1972 and Supplemental Instructions dated June 7, 1972 for Group No. 575, Montana.

Independent resurvey plat memoranda involve a great variety of situations, and must be tailored to the specific circumstances.



for Group No.
nt resurveys the
e shown only in
he differences be-
the vacant sub-
y and the former
nal approved plat
revision. In that
ision rests upon
r than upon that
poses a variation
to the quarter-
l advisable before
number and area
ubdivision which
within the section
ons cannot be re-

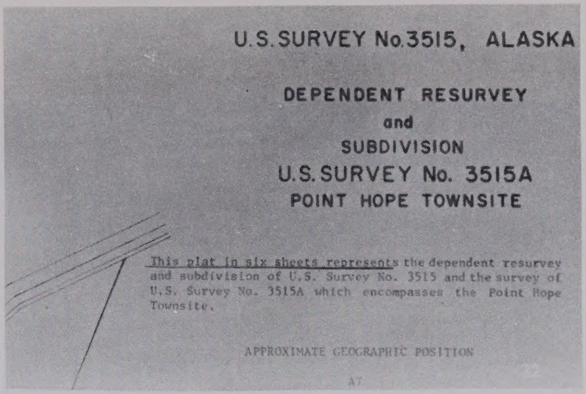
cancelled plat, the locations are identified in accordance with the marks of that survey.

The following should be regarded as a general suggestion:

> **This plat represents a resurvey which is independent of and that supersedes, so far as the public lands are concerned (hereon indicated by new subdivisional lines, lottings, and areas) all such similar units that are shown upon the plat (or plats) approved .... (date or dates).**
>
> **All tract segregations shown hereon represent the position and form of said tracts under the original description as referred to the original survey, located as such units and marked on the ground according to the best available evidence of their legal boundaries.**

Where the boundaries of certain sections of the former survey have been restored as the best identification and form of protection to the alienated lands, and possibly including other sections entirely public land whose boundaries

The first sheet of a set of plat sheets contains a statement of the total number of sheets in the set.



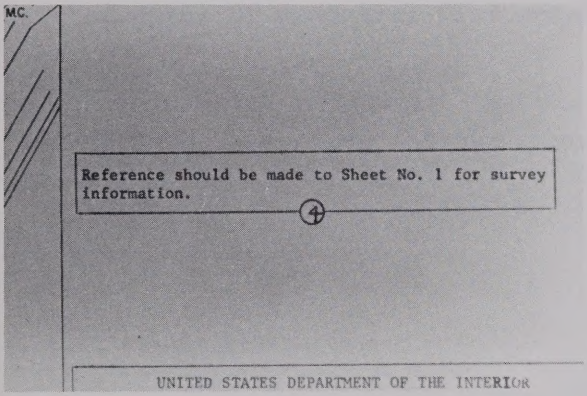
U.S. SURVEY No.3515, ALASKA

DEPENDENT RESURVEY
and
SUBDIVISION
U.S. SURVEY No. 3515A
POINT HOPE TOWNSITE

This plat in six sheets represents the dependent resurvey and subdivision of U.S. Survey No. 3515 and the survey of U.S. Survey No. 3515A which encompasses the Point Hope Townsite.

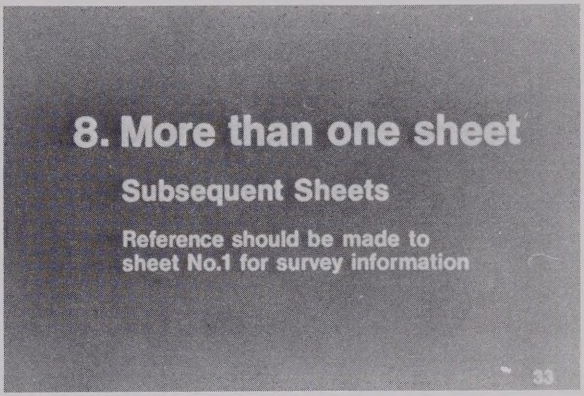
APPROXIMATE GEOGRAPHIC POSITION

AT



Reference should be made to Sheet No. 1 for survey information.

UNITED STATES DEPARTMENT OF THE INTERIOR

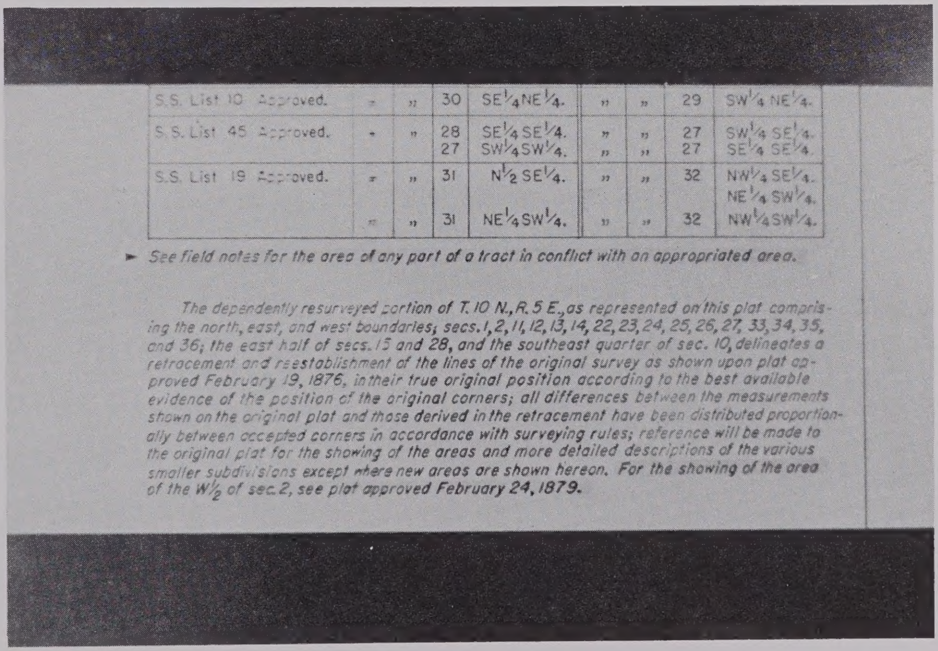


8. More than one sheet

Subsequent Sheets

Reference should be made to sheet No.1 for survey information

The subsequent sheets refer to the first sheet.

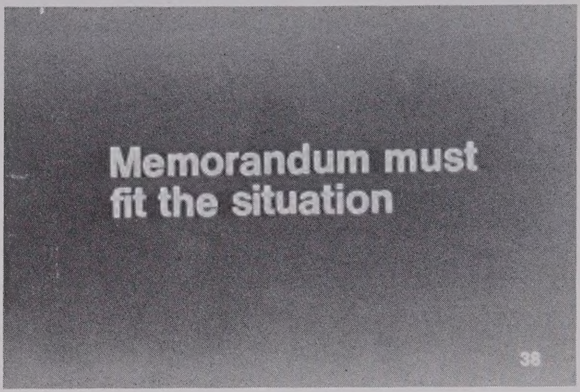


S.S. List 10 Approved.	►	”	30	SE¼NE¼.	”	”	29	SW¼ NE¼.
S.S. List 45 Approved.	►	”	28 27	SE¼ SE¼. SW¼SW¼.	” ”	” ”	27 27	SW¼ SE¼. SE¼ SE¼.
S.S. List 19 Approved.	►	”	31	N½ SE¼.	”	”	32	NW¼ SE¼. NE¼ SW¼.
	►	”	31	NE¼SW¼.	”	”	32	NW¼SW¼.

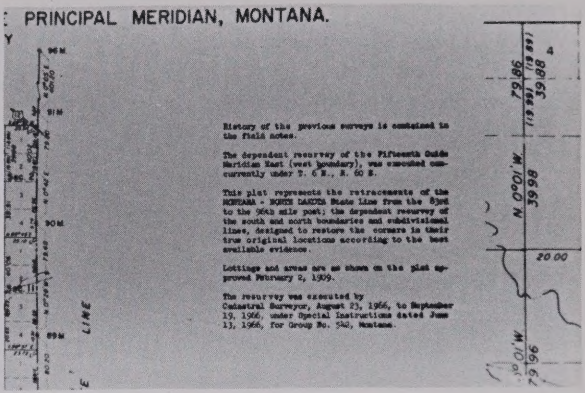
► *See field notes for the area of any part of a tract in conflict with an appropriated area.*

The dependently resurveyed portion of T. 10 N., R. 5 E., as represented on this plat comprising the north, east, and west boundaries; secs. 1, 2, 11, 12, 13, 14, 22, 23, 24, 25, 26, 27, 33, 34, 35, and 36; the east half of secs. 15 and 28, and the southeast quarter of sec. 10, delineates a retracement and reestablishment of the lines of the original survey as shown upon plat approved February 19, 1876, in their true original position according to the best available evidence of the position of the original corners; all differences between the measurements shown on the original plat and those derived in the retracement have been distributed proportionally between accepted corners in accordance with surveying rules; reference will be made to the original plat for the showing of the areas and more detailed descriptions of the various smaller subdivisions except where new areas are shown hereon. For the showing of the area of the W½ of sec. 2, see plat approved February 24, 1879.

Survey data which is not depicted on the plat is referred to in a plat statement.



Memorandum must fit the situation



PRINCIPAL MERIDIAN, MONTANA.

History of the previous surveys is contained in the field notes.

The dependent resurvey of the Fifteenth Guide Meridian East (west boundary), was executed concurrently under T. 6 N., R. 60 E.

This plat represents the retracements of the MONTANA - NORTH DAKOTA State Line from the 83rd to the 96th mile post; the dependent resurvey of the south and north boundaries and subdivisional lines, designed to restore the corners in their true original locations according to the best available evidence.

Lottings and areas are as shown on the plat approved February 2, 1909.

The resurvey was executed by
Cadastral Surveyor, August 23, 1966, to September 19, 1966, under Special Instructions dated June 13, 1966, for Group No. 542, Montana.

The key to plat memoranda is to embody the particular circumstances of the survey.

Exercise No. 11

1) What is the purpose of the memorandum on a cadastral survey plat?

2) What memorandum statement should be made on sheets subsequent to the principal sheet of a set of cadastral plat sheets?

3) Some judgement will be necessary in determining the content and extensiveness of cadastral plat memoranda. TRUE or FALSE

4) The name, or names, of the surveyor(s) executing the survey, the dates of survey, and a reference to the Assignment Instructions should be mentioned in each memorandum. TRUE or FALSE

Answers to Exercise No. 11

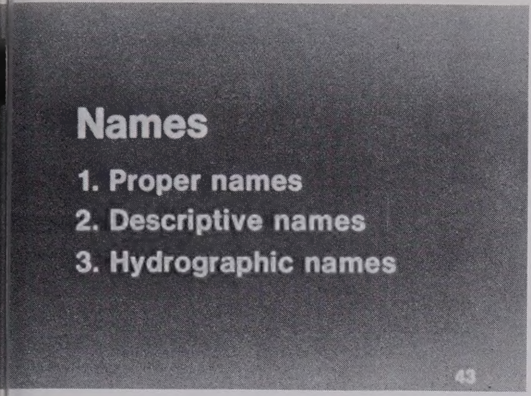
1) The memorandum should correlate and consolidate the record of subsisting surveys as shown on the plat.

   As appropriate, the memoranda should clarify such items as the character of dependent resurveys, and should make reference to related previous plats, modification of lottings, omitted lands, accretions, history of prior surveys, field notes which appear on the plat, number of sheets in the total set, particular lines retraced, and survey data which is omitted from the plat.

2) "Reference should be made to Sheet Number 1 for survey information".

3) TRUE

4) FALSE. Reference should be made to the surveyors, dates of survey, and Special Instructions.

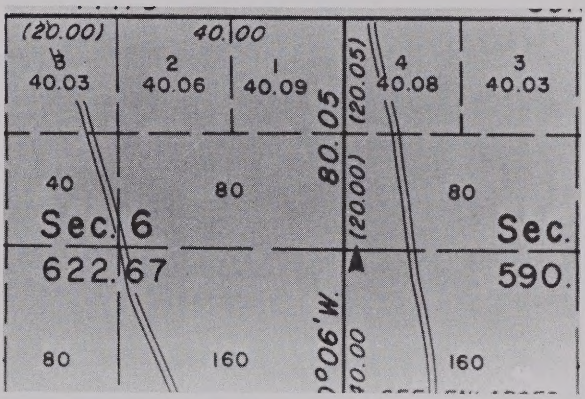


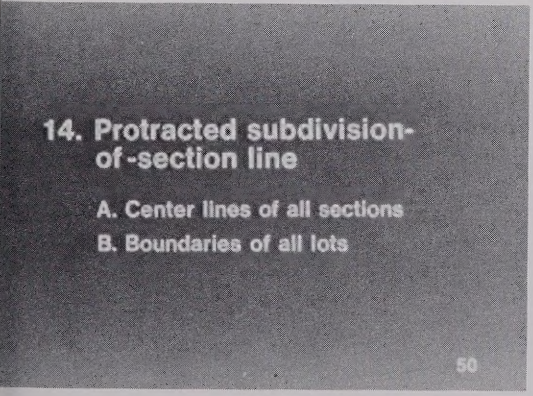
Names

1. Proper names
2. Descriptive names
3. Hydrographic names

Three classes of names have distinct lettering styles.

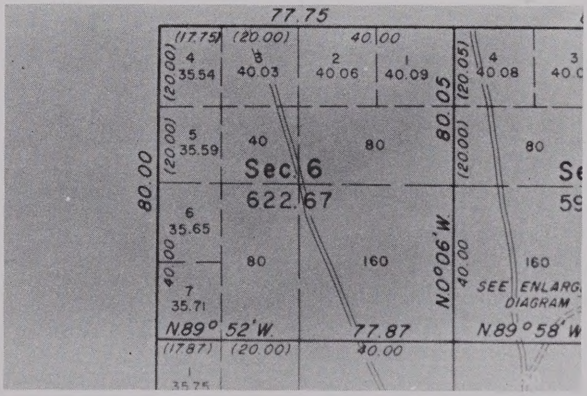
renthetical distances are one of
e most important plat require-
nts.



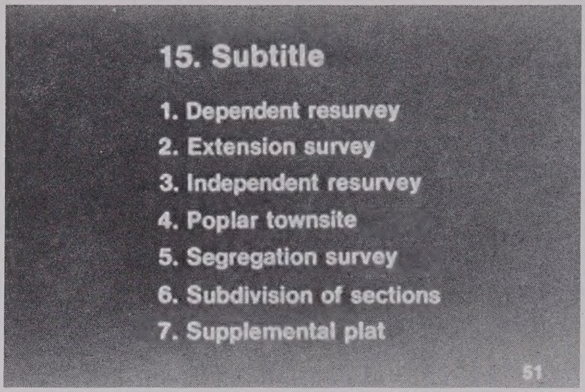


14. Protracted subdivision-of-section line

A. Center lines of all sections
B. Boundaries of all lots

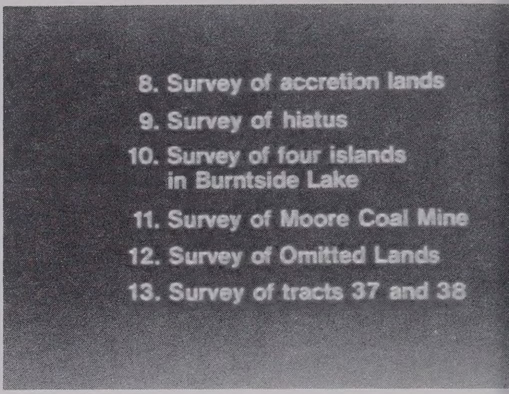


ere are two items to remember about protracted subdivision of section
es.



15. Subtitle

1. Dependent resurvey
2. Extension survey
3. Independent resurvey
4. Poplar townsite
5. Segregation survey
6. Subdivision of sections
7. Supplemental plat



8. Survey of accretion lands
9. Survey of hiatus
10. Survey of four islands in Burntside Lake
11. Survey of Moore Coal Mine
12. Survey of Omitted Lands
13. Survey of tracts 37 and 38

A subtitle briefly indicates the main purpose of the plat.

Exercise No. 12

) Name by subject or example the three categories of names required on cadastral survey plats.

2) Parenthetical distances are used on the plat to indicate distances to ____________________ control corners. Their chief purpose is to determine ____.

3) What are the two things that the cadastral draftsperson should remember about protracted subdivision of section lines?

4) What purpose does a plat subtitle serve?

Answers to Exercise No. 12

1) Proper names such as, Lake City Townsite; descriptive names such as, Alkali Flat; hydrographic names such as, Clear Lake.

2) unmonumented; the area of fractional lots.

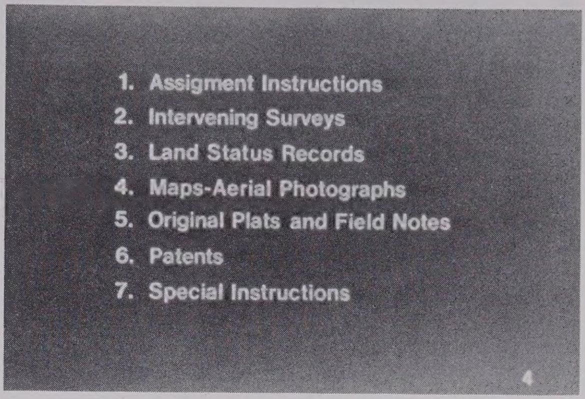
3) The centerlines of all sections and the boundaries of all lots are required on the plats.

4) The subtitle very briefly explains the special purpose of the plat, if there is a special purpose.

SOURCES OF INFORMATION FOR PLAT PREPARATION

EL SIX

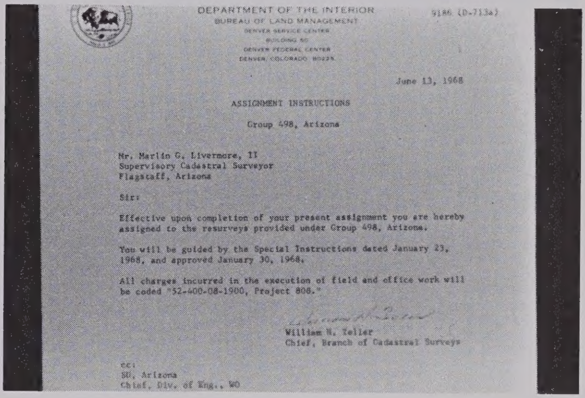
ven sources of information will
ssist the draftsperson in plat
reparation.



1. Assigment Instructions
2. Intervening Surveys
3. Land Status Records
4. Maps-Aerial Photographs
5. Original Plats and Field Notes
6. Patents
7. Special Instructions

4

n official survey can not be made
ithout assignment instructions.



DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
DENVER SERVICE CENTER
BUILDING 50
DENVER FEDERAL CENTER
DENVER, COLORADO 80225

9186 (D-713a)

June 13, 1968

ASSIGNMENT INSTRUCTIONS

Group 498, Arizona

Mr. Marlin G. Livermore, II
Supervisory Cadastral Surveyor
Flagstaff, Arizona

Sir:

Effective upon completion of your present assignment you are hereby assigned to the resurveys provided under Group 498, Arizona.

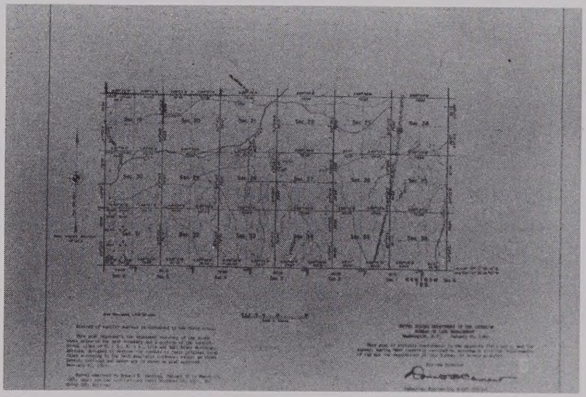
You will be guided by the Special Instructions dated January 23, 1968, and approved January 30, 1968.

All charges incurred in the execution of field and office work will be coded "52-400-08-1900, Project 808."

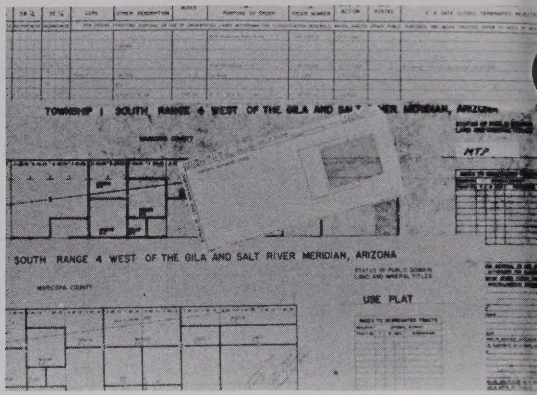
William H. Zeller
Chief, Branch of Cadastral Surveys

cc:
SD, Arizona
Chief, Div. of Eng., WO

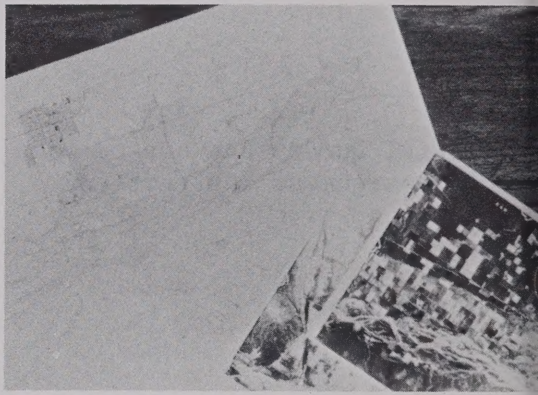
urveys which have been made in
he area since the original survey
ay contain controlling information.



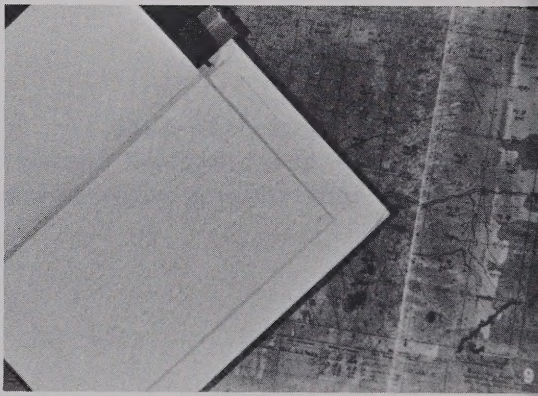
Land status records indicate to the draftsperson aspects such as vacant lands.


TOWNSHIP 1 SOUTH RANGE 4 WEST OF THE GILA AND SALT RIVER MERIDIAN, ARIZONA
MTP
SOUTH RANGE 4 WEST OF THE GILA AND SALT RIVER MERIDIAN, ARIZONA
MARICOPA COUNTY
USE PLAT

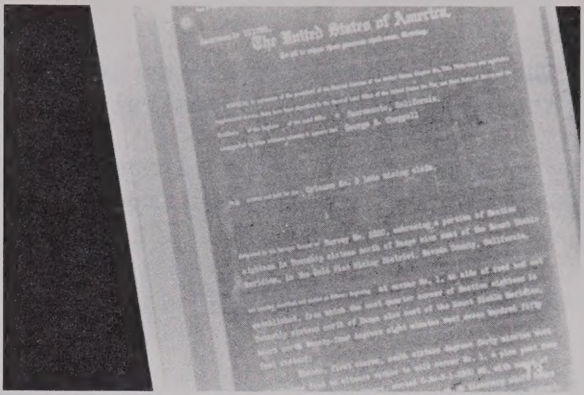
Maps and aerial photographs provide topography, cultural delineation, and name information.



Original plats and field notes are the basic control for subsequent surveys, and have information which is incorporated into subsequent plats.

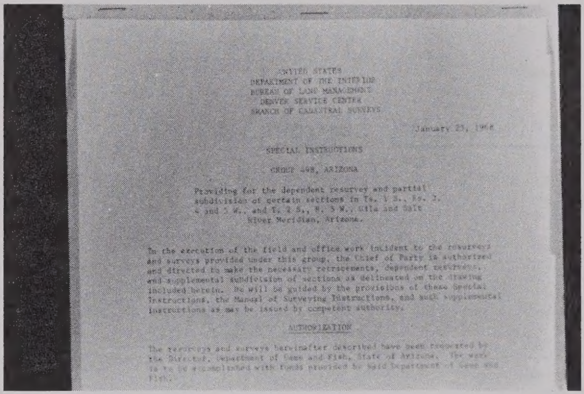


atent documents indicate private wnerships with any reservations o the United States.



The United States of America.

he Special Instructions contain nformation which must appear on he plat; and they will assist he draftsperson in layout planing.



UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
DENVER SERVICE CENTER
BRANCH OF CADASTRAL SURVEYS

January 23, [illegible]

SPECIAL INSTRUCTIONS

GROUP 498, ARIZONA

Providing for the dependent resurvey and partial subdivision of certain sections in Ts. 1 S., Rs. 3, 4 and 5 W., and T. 2 S., R. 5 W., Gila and Salt River Meridian, Arizona.

In the execution of the field and office work incident to the resurveys and surveys provided under this group, the Chief of Party is authorized and directed to make the necessary retracements, dependent resurveys, and supplemental subdivision of sections as delineated on the drawing included herein. He will be guided by the provisions of these Special Instructions, the Manual of Surveying Instructions, and such supplemental instructions as may be issued by competent authority.

AUTHORIZATION

The resurveys and surveys hereinafter described have been requested by the Director, Department of Game and Fish, State of Arizona. The work is to be accomplished with funds provided by said Department of Game and Fish.

There are seven categories of information which need to be researched for the preparation of cadastral survey plats.

For each of the seven categories listed below, state a reason as to why research of the item is important.

assignment instructions

intervening surveys

land status records

maps and aerial photographs

original plats and field notes

patents

special instructions

Answers to Exercise No. 13

Assignment instructions give the name of the surveyor who is to execute the survey. This name is the one which will appear on the plat.

Intervening surveys, including non-BLM surveys, may contain information which will assist in the delineation of various features.

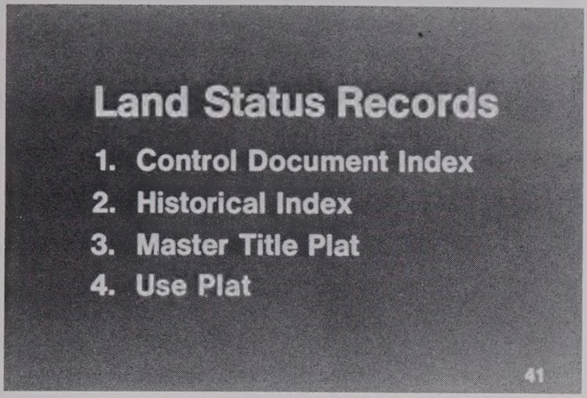
Land status records indicate ownerships, which is directly related to what is portrayed on the plat.

Maps and aerial photographs can be used for topographic information, for obtaining geographic position and names, and for general orientation.

Original plats and field notes control what is done in subsequent surveys.

Patents may serve as a source of reference in resolving apparent conflicts, or to verify vague information.

Special Instructions furnish "foundation" information such as group number and state, and, very importantly, can orient the draftsperson to the extent, technique, methods, and special considerations of the survey.

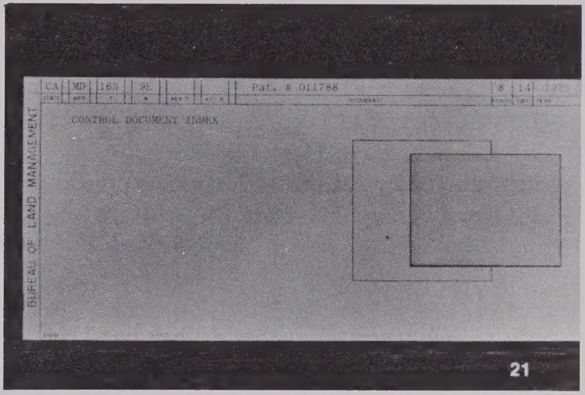


Land Status Records

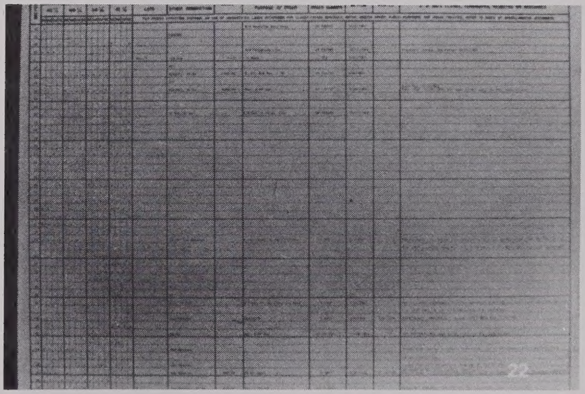
1. Control Document Index
2. Historical Index
3. Master Title Plat
4. Use Plat

Land status records consists of four types. The draftsperson makes frequent reference to them when constructing the plat.

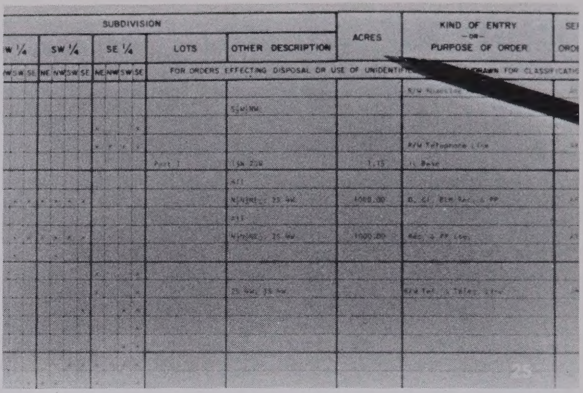
Available in each State Office is the microfilmed Control Document Index which consists of copies of title or interest conveyances from the United States.


CA
MD
16N
9E
Pat. # 011786
8
14
1975
CONTROL DOCUMENT INDEX
BUREAU OF LAND MANAGEMENT
21

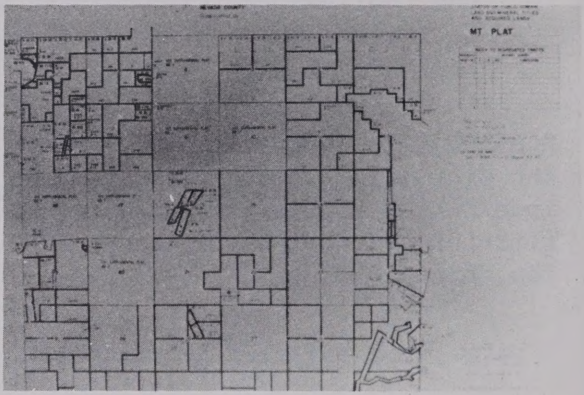
The Historical Index is a composite accounting, by township, of all official applications or transactions which affect, or may affect the public lands.



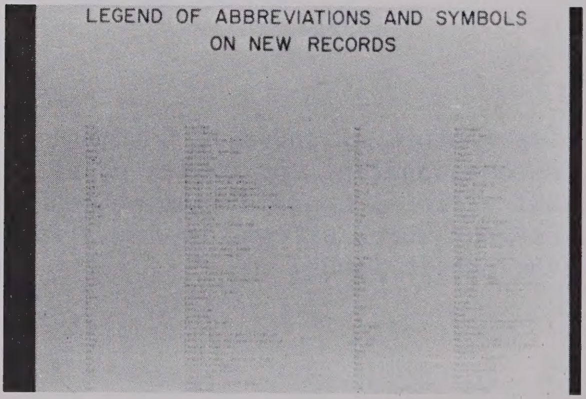
The information in the H.I. is arranged in eight columns, by section.


SUBDIVISION
W ¼
SW ¼
SE ¼
LOTS
OTHER DESCRIPTION
ACRES
KIND OF ENTRY
—OR—
PURPOSE OF ORDER

The Master Title Plat, or MTP, is a township diagram indicating ownerships, patent numbers, and reservations to the United States.



A BLM-produced legend sheet of abbreviations, line weights, and symbols for the MTP will be quite helpful to the draftsperson.


LEGEND OF ABBREVIATIONS AND SYMBOLS
ON NEW RECORDS

Exercise No. 14

1) Match the categories on the left with the most appropriate phrases on the right.

The phrases on the right may be used more than once. Some phrases may not be used at all.

Control Document Index

Historical Index

Master Title Plat

(a) eight columns

(b) 35 mm microfilm

(c) line weights indicating extent of ownership

(d) distances and bearings

(e) copies of conveyances

(f) column listing of sections, acres, type of action, file number, dates

(g) township diagram

(h) M & P factors

(i) reservations to the U.S. are delineated on a diagram

(j) land status record

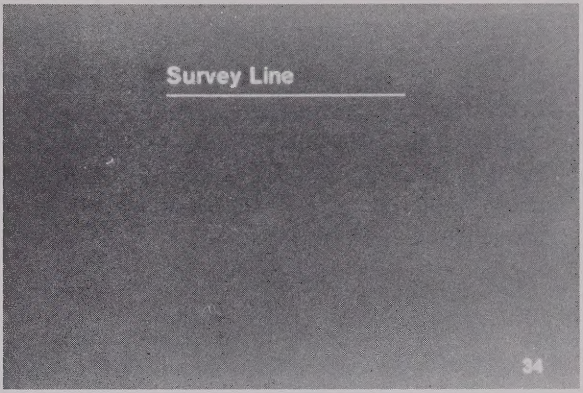
Answers to Exercise No. 14

Control Document Index - (b), (e), (j)

Historical Index - (a), (f), (j)

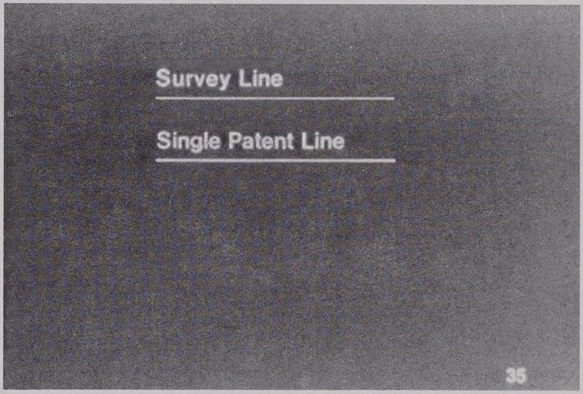
Master Title Plat - (c), (g), (i), (j)

A survey line on the MTP indicates public ownership on both sides of the line.



Survey Line

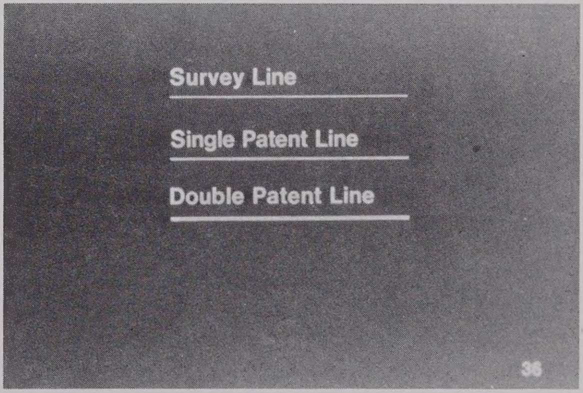
When there is public ownership on only one side of a boundary, a slightly heavier line is used.



Survey Line

Single Patent Line

And when there is private ownership on both sides of a demarcation, the widest line is used.

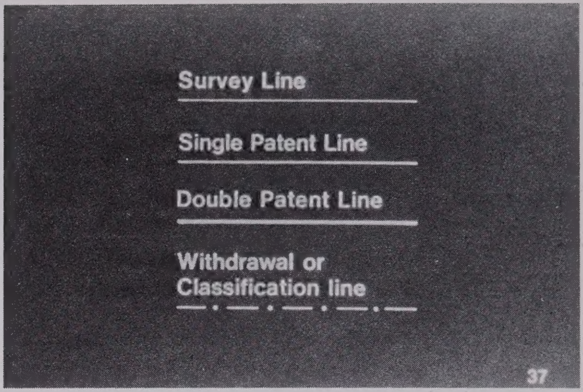


Survey Line

Single Patent Line

Double Patent Line

Withdrawal lines, or notations on the margin of the MTP when an entire township is affected, tell the user that the public lands are closed to certain uses.



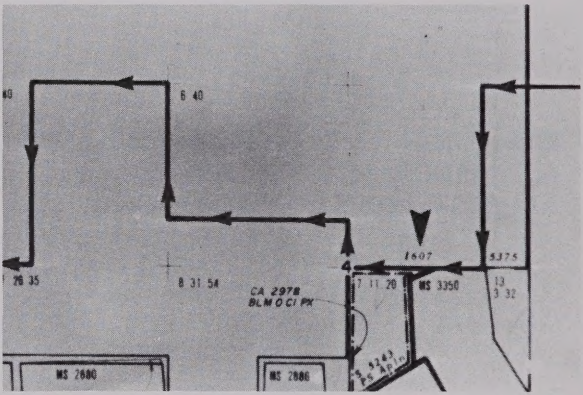
Survey Line

Single Patent Line

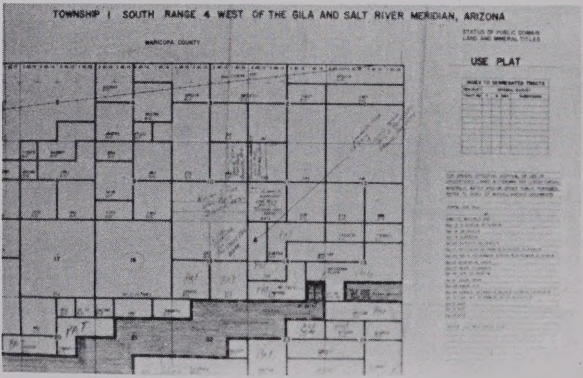
Double Patent Line

Withdrawal or Classification line

The numbers near the lower edges (and within) the particular delineating boundary lines refer the user to patent, application, reservation, or other filed information.

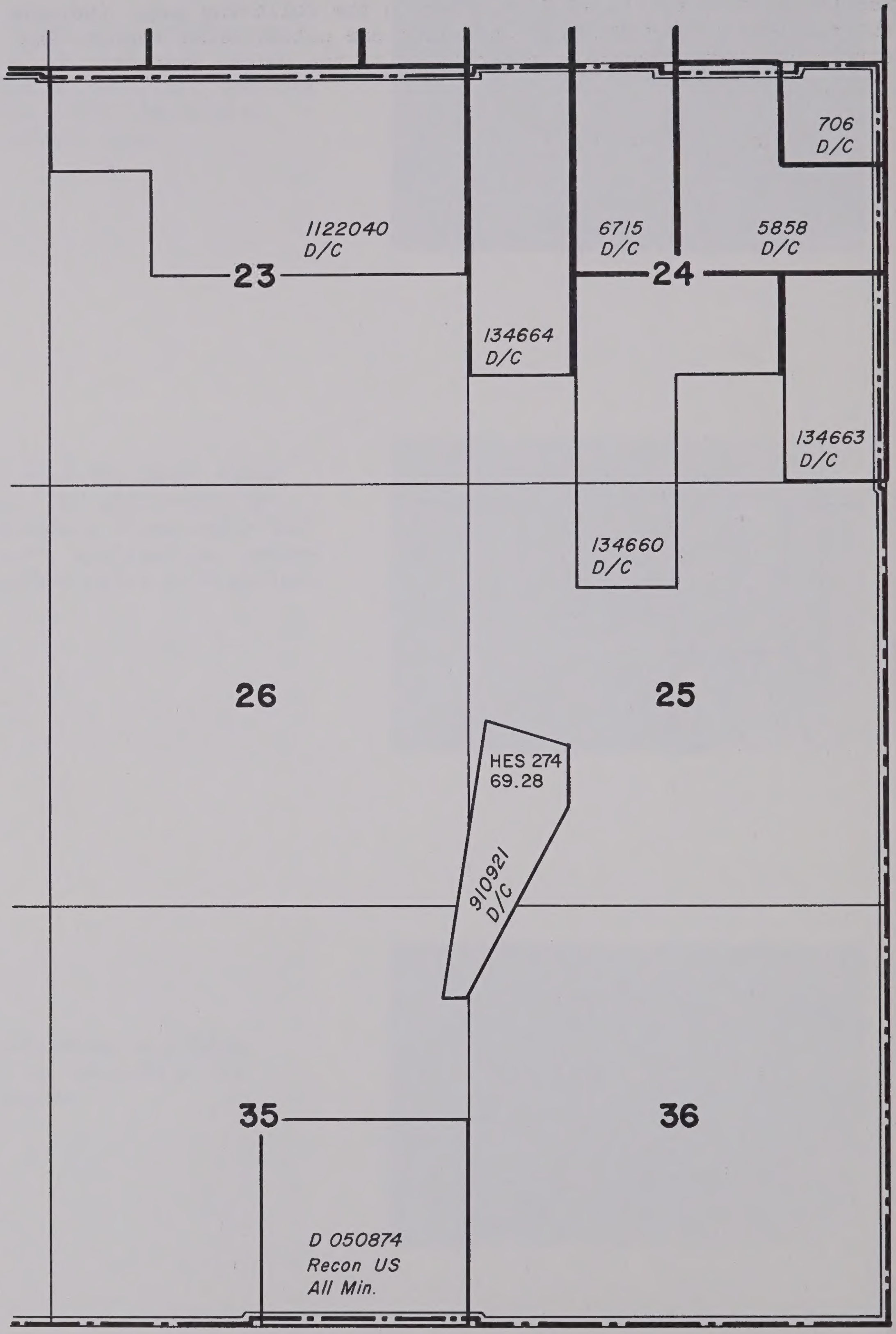


Use Plats pertaining to public lands leased to the public for specific purposes.


TOWNSHIP 1 SOUTH RANGE 4 WEST OF THE GILA AND SALT RIVER MERIDIAN, ARIZONA
MARICOPA COUNTY
STATUS OF PUBLIC DOMAIN LAND AND MINERAL TITLES
USE PLAT

Exercise No. 15

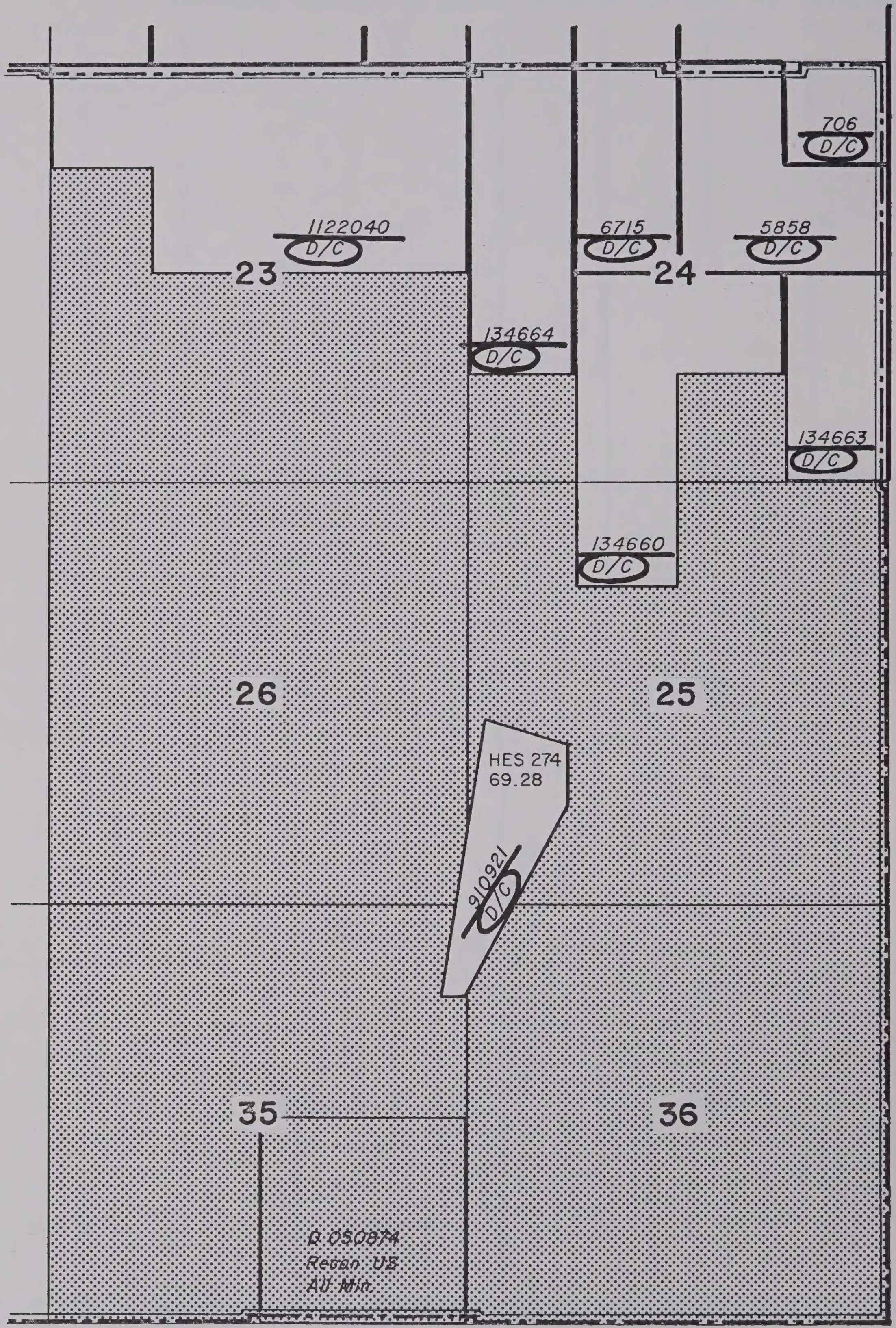
For the portion of the MT Plat shown on the following page, indicate the public lands by shading, underline one patent order number, and circle one indication of a reservation to the United States.


706
D/C
1122040
D/C
23
6715
D/C
5858
D/C
24
134664
D/C
134663
D/C
134660
D/C
26
25
HES 274
69.28
910921
D/C
35
36
D 050874
Recon US
All Min.

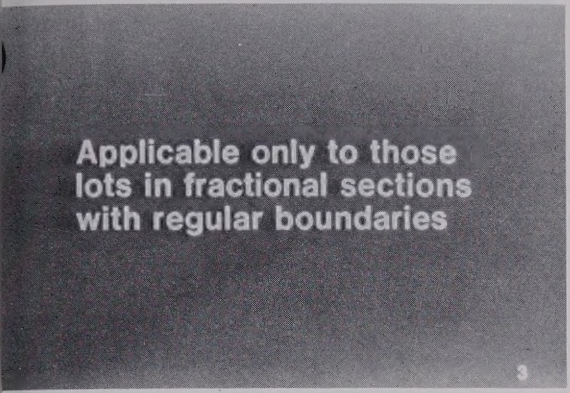
) The fourth component of the land status record system, the Use Plat, indicates the uses of lands which are in private ownership.
TRUE or FALSE

Answers to Exercise No. 15

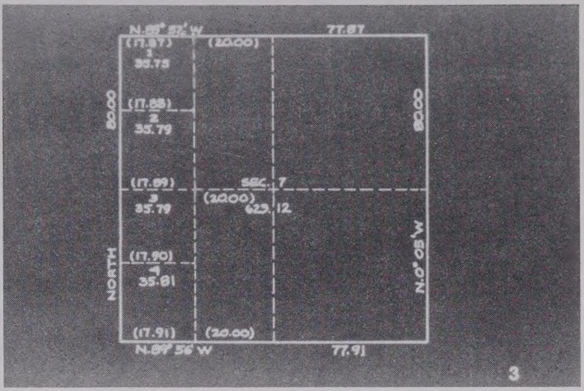
1)



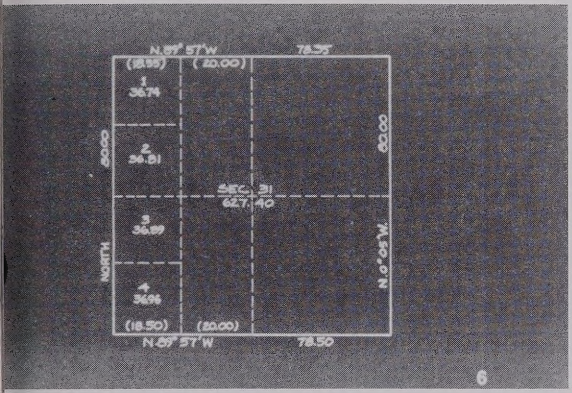
2) FALSE. The Use Plat indicates lands which are leased to the public for specific uses.

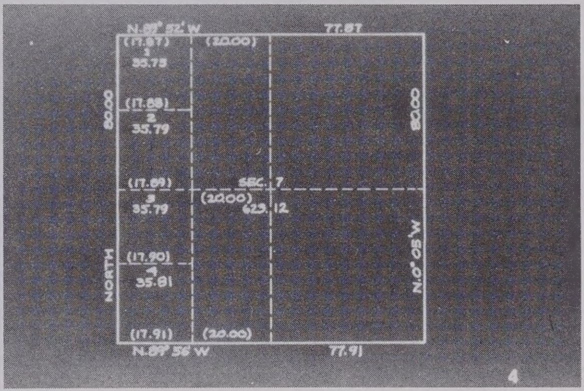


Applicable only to those lots in fractional sections with regular boundaries

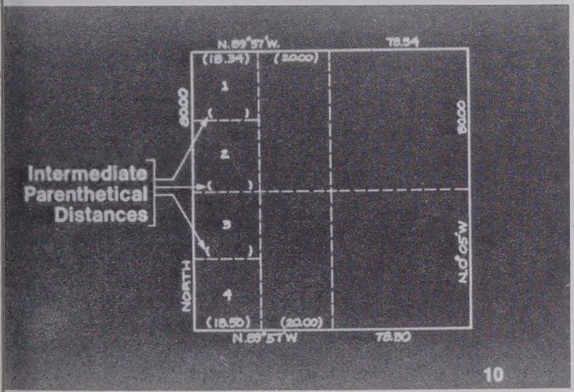


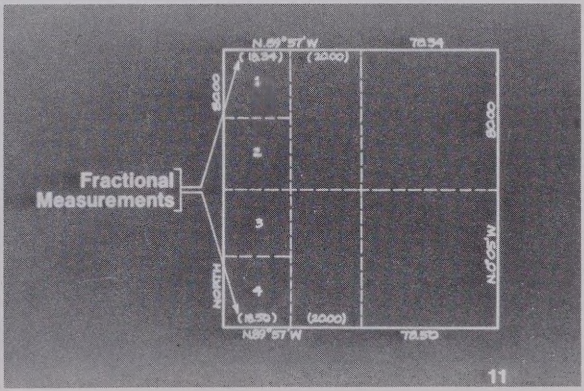
The methods employed in this unit and the immediate next unit, are limited to lines which do not depart more than one degree from cardinal.



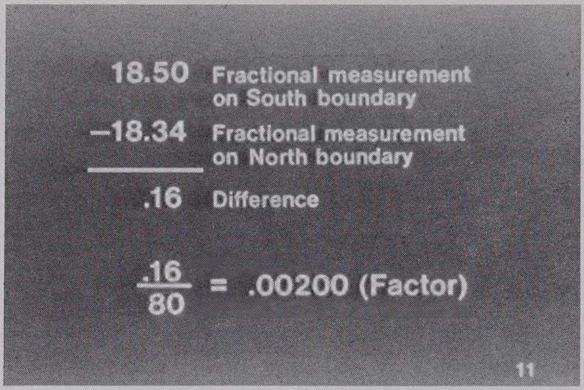


Parenthetical distances are usually shown on surveyed lines and implied on protracted lines.





One method for finding intermediate parenthetical distances is to determine the difference between fractional distances on opposite section boundaries...

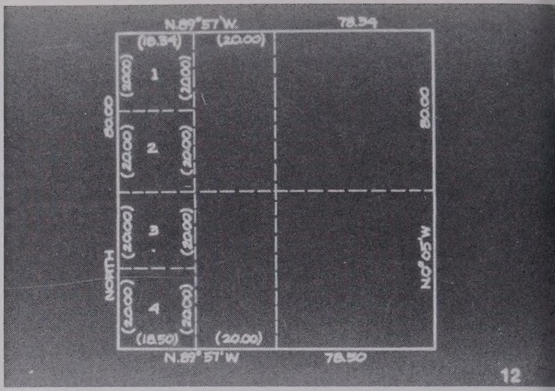


18.50 Fractional measurement on South boundary

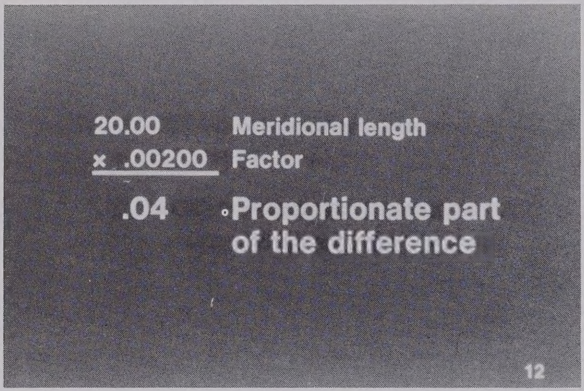
−18.34 Fractional measurement on North boundary

.16 Difference

$\frac{.16}{80}$ = .00200 (Factor)



Then, divide the found difference by the total length of the adjacent boundary to obtain a factor ...

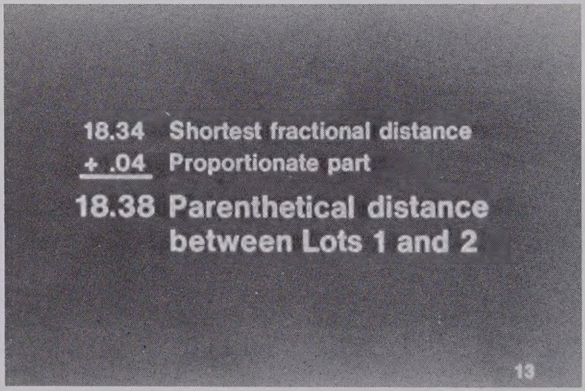


20.00 Meridional length

× .00200 Factor

.04 Proportionate part of the difference

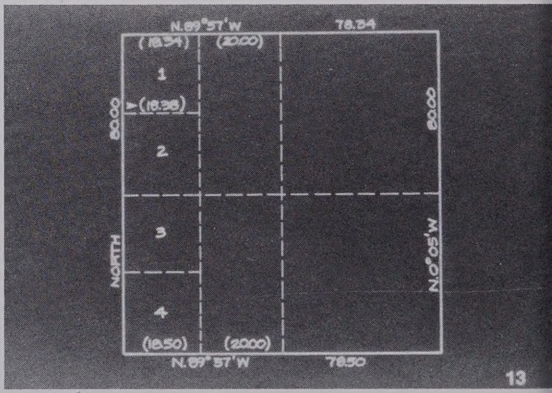
Multiply the factor times each separate lot length of the adjacent boundary line ...



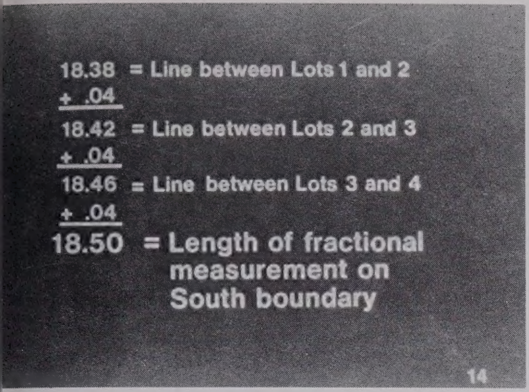
18.34 Shortest fractional distance

+ .04 Proportionate part

18.38 Parenthetical distance between Lots 1 and 2

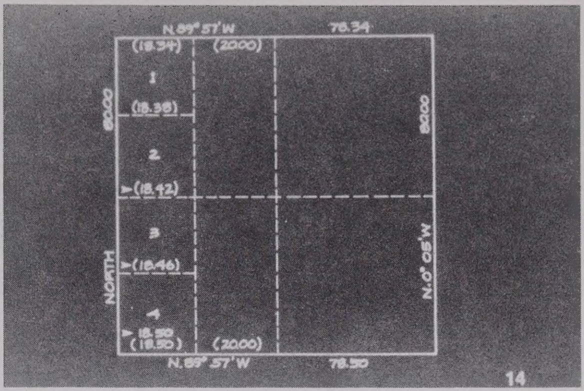


And then add or subtract the proportionate part thus found to the shortest or longest given fractional distance, respectively ...



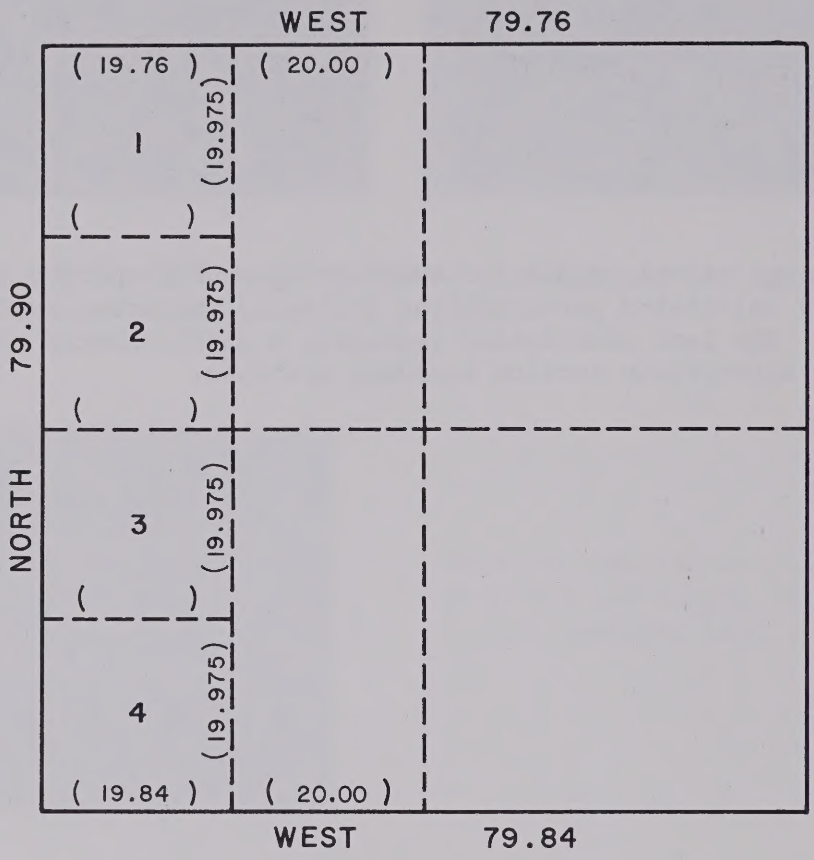
18.38 = Line between Lots 1 and 2
+ .04
18.42 = Line between Lots 2 and 3
+ .04
18.46 = Line between Lots 3 and 4
+ .04
18.50 = Length of fractional measurement on South boundary

14

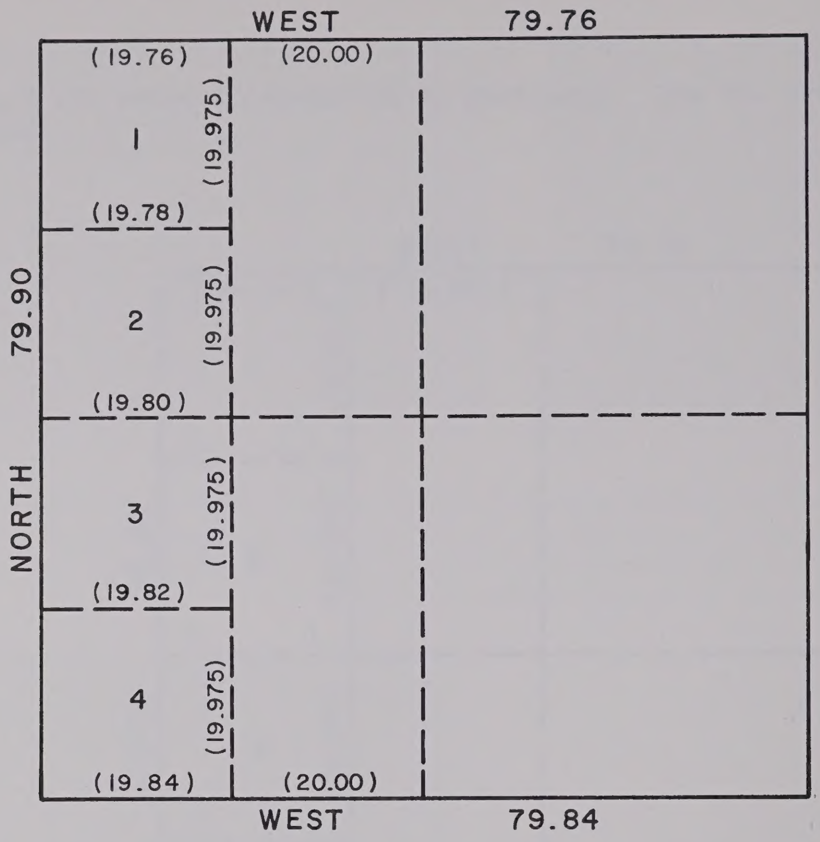


ally, by progressively adding or subtracting each proportionate part to e previously calculated parenthetical distance, the necessary lot distances e obtained. The last calculation (actually a check) should give the same sult as the appropriate section boundary distance.

Insert the correct parenthetical distances. Use the proportionate part method.



Answer to Exercise No. 16



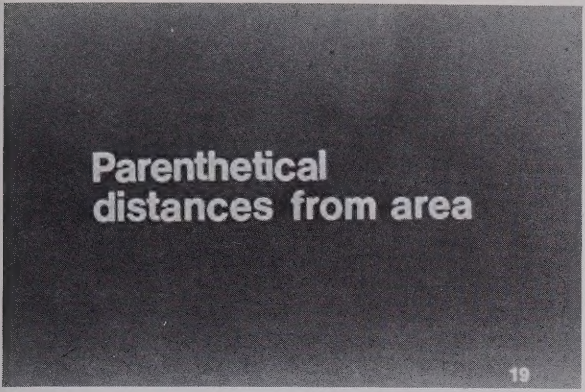
```
 19.84 fractional measurement on south boundary
-19.76 fractional measurement on north boundary
   .08
```

.08 ÷ 79.90 = .010 (Factor)

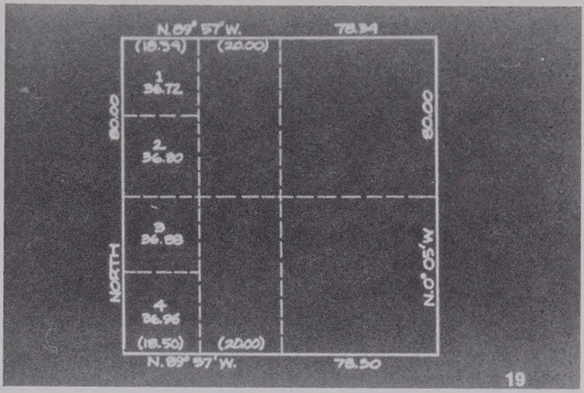
```
 19.975
X  .010
   .020  Proportionate part of difference
```

```
 19.76      19.78      19.80      19.82
+  .02     +  .02     +  .02     +  .02
 19.78      19.80      19.82      19.84
```

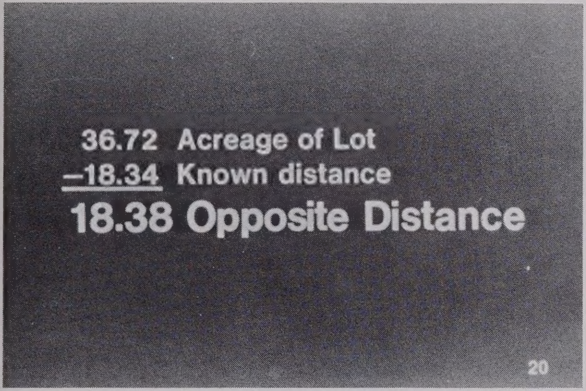
Another Method for Determining Parenthetical Distances



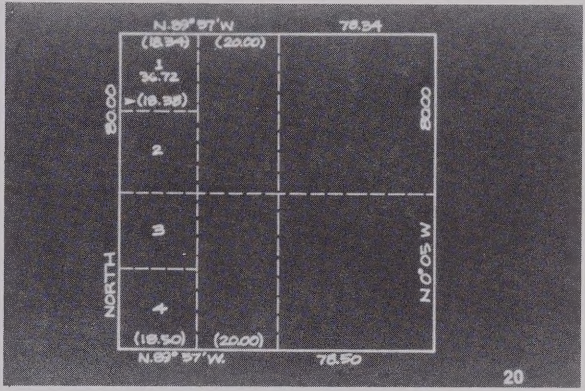
Parenthetical distances from area



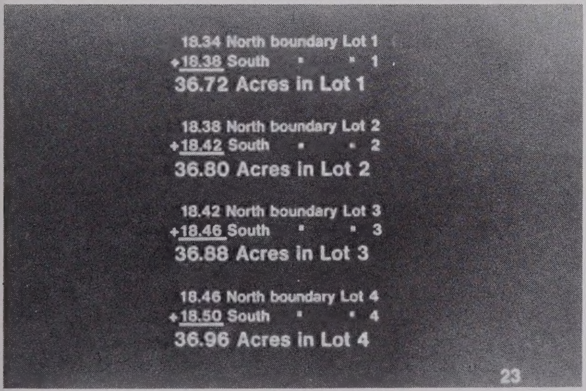
When lot areas are given on a previous plat, the record distance for corner points can be found by computing with the given acreages.



36.72 Acreage of Lot
−18.34 Known distance
18.38 Opposite Distance



A simple computation - subtract the given distance from the given acreage - and obtain the opposite parenthetical distance for the lot.

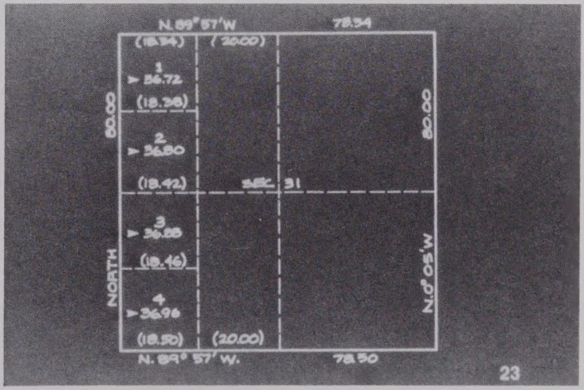


18.34 North boundary Lot 1
+18.38 South " " 1
36.72 Acres in Lot 1

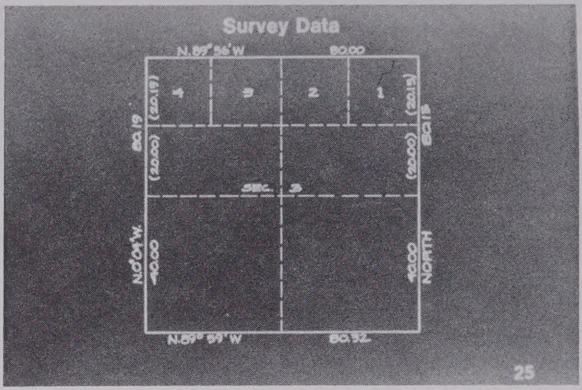
18.38 North boundary Lot 2
+18.42 South " " 2
36.80 Acres in Lot 2

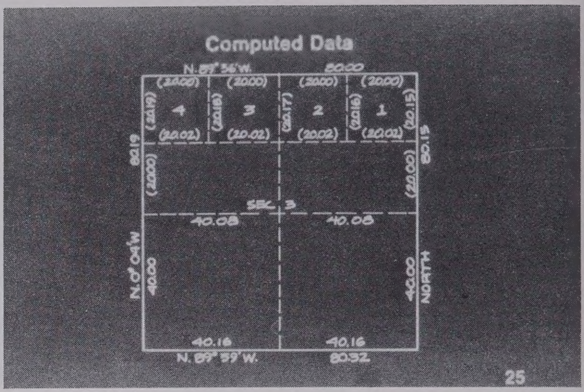
18.42 North boundary Lot 3
+18.46 South " " 3
36.88 Acres in Lot 3

18.46 North boundary Lot 4
+18.50 South " " 4
36.96 Acres in Lot 4

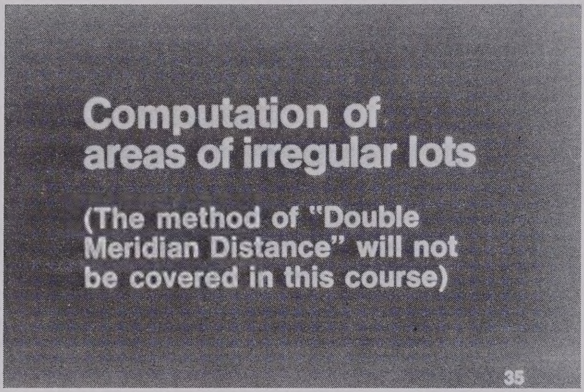


Conversely, an easy way to compute needed acreages is merely to add together the fractional distances on opposite lot boundaries.



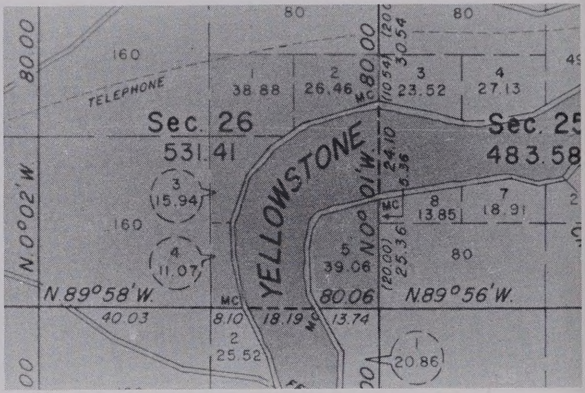


This acreage method of computation will work even though the two other opposite lot boundaries are not exactly 20.00 chains.

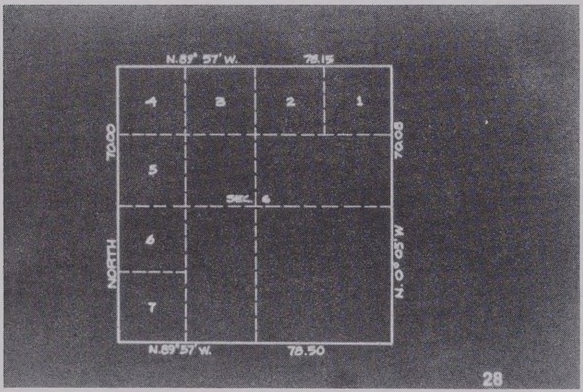


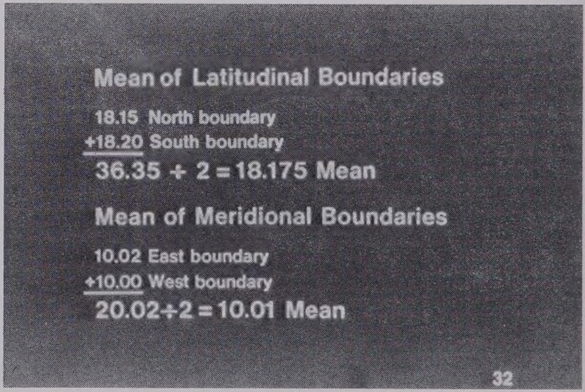
Computation of areas of irregular lots

(The method of "Double Meridian Distance" will not be covered in this course)



However, for irregular lots, the acreage method can not be used; the DMD method is the authorized method in this case.





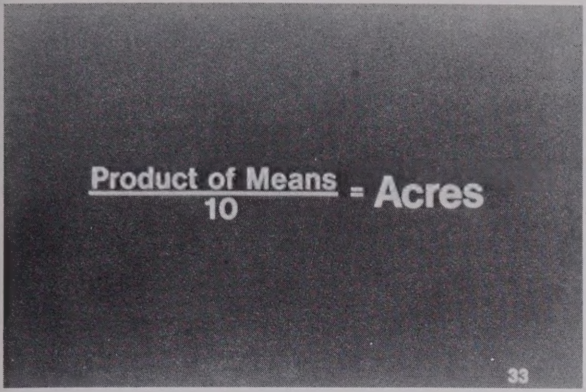
Mean of Latitudinal Boundaries

18.15 North boundary
+18.20 South boundary
36.35 ÷ 2 = 18.175 Mean

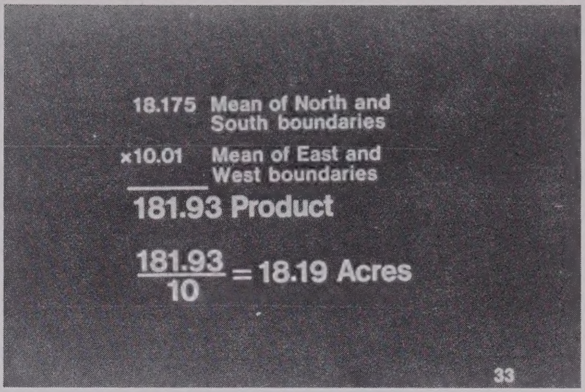
Mean of Meridional Boundaries

10.02 East boundary
+10.00 West boundary
20.02÷2 = 10.01 Mean

In computing the area of lot 4, section 6, the mean dimensions of both sets of opposite boundaries are found.



$$\frac{\text{Product of Means}}{10} = \text{Acres}$$



18.175 Mean of North and South boundaries

×10.01 Mean of East and West boundaries

181.93 Product

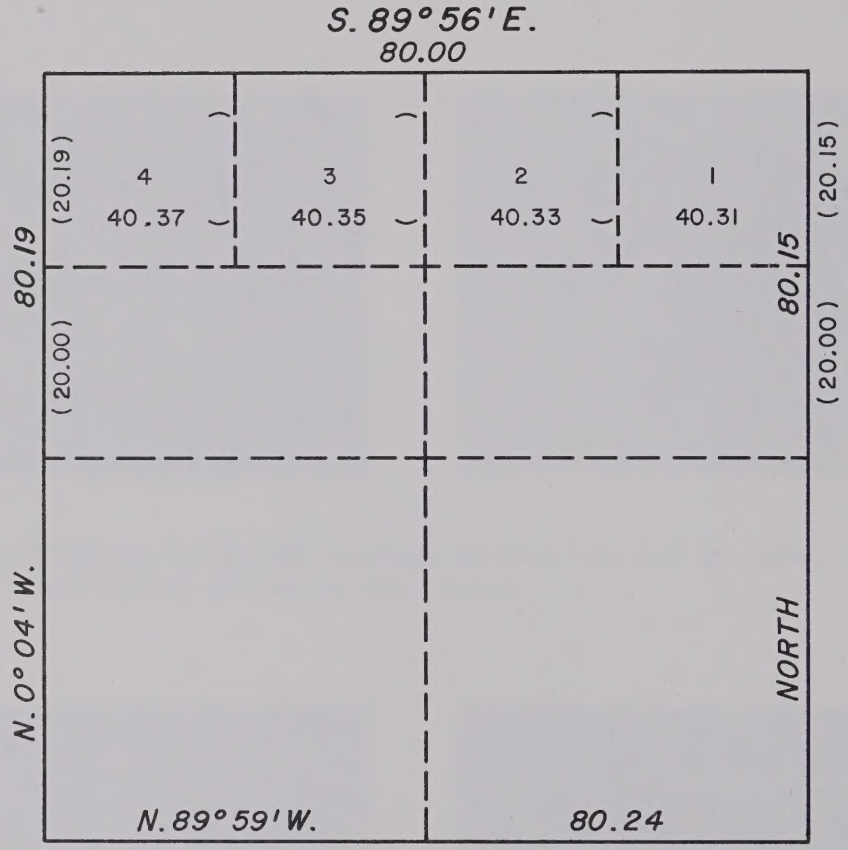
$$\frac{181.93}{10} = 18.19 \text{ Acres}$$

Then, multiply the two means together, and divide by 10 to obtain the acreage.

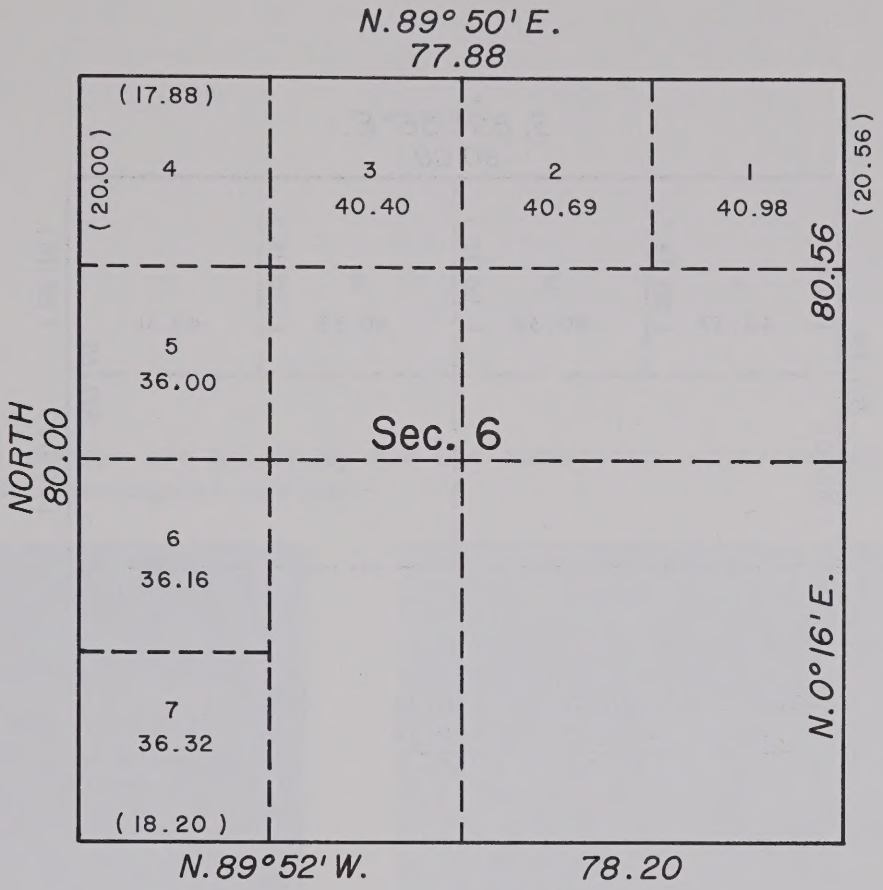
Exercise No. 17

1) If any of the lot lines of a lot for which an acreage determination is being calculated depart more than one degree from cardinal direction, the ______________________ method of calculation must be used.

2) Insert the correct parenthetical distances. Use the acreage method.



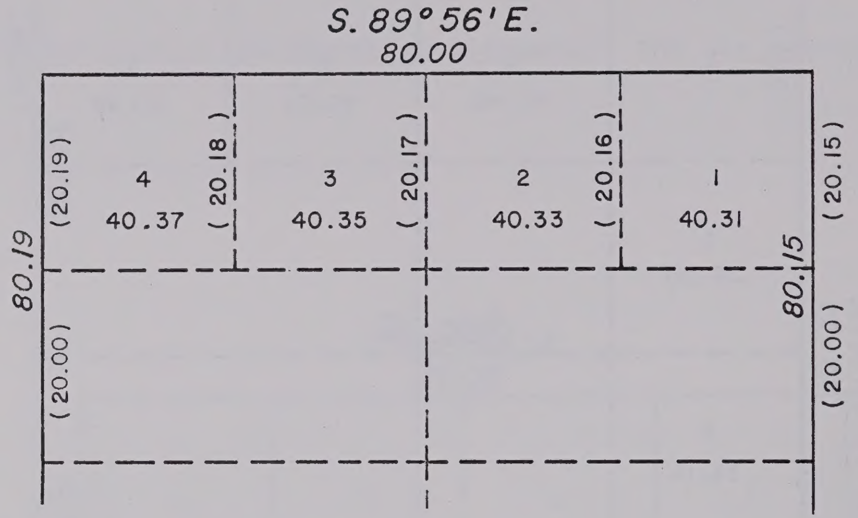
3) Compute the acreage for Lot 4.



Answers to Exercise No. 17

1) DMD, or double meridian distances

2)



$$\begin{array}{r} 40.37 \\ -20.19 \\ \hline 20.18 \end{array} \qquad \begin{array}{r} 40.35 \\ -20.18 \\ \hline 20.17 \end{array} \qquad \begin{array}{r} 40.33 \\ -20.17 \\ \hline 20.16 \end{array} \qquad \begin{array}{r} 40.31 \\ -20.16 \\ \hline 20.15 \end{array}$$

3)

$$\begin{array}{r} 36.32 \\ -18.20 \\ \hline 18.12 \end{array}$$ Lots 6 and 7

$$\begin{array}{r} 36.16 \\ -18.12 \\ \hline 18.04 \end{array}$$ Lots 5 and 6

$$\begin{array}{r} 36.00 \\ -18.04 \\ \hline 17.96 \end{array}$$ Lots 4 and 5

$$\begin{array}{r} 40.98 \\ -20.56 \\ \hline 20.42 \end{array}$$ Lots 1 and 2

$$\begin{array}{r} 40.69 \\ -20.42 \\ \hline 20.27 \end{array}$$ Lots 2 and 3

$$\begin{array}{r} 40.40 \\ -20.27 \\ \hline 20.13 \end{array}$$ Lots 3 and 4

17.96 + 17.88 ÷ 2 = 17.92

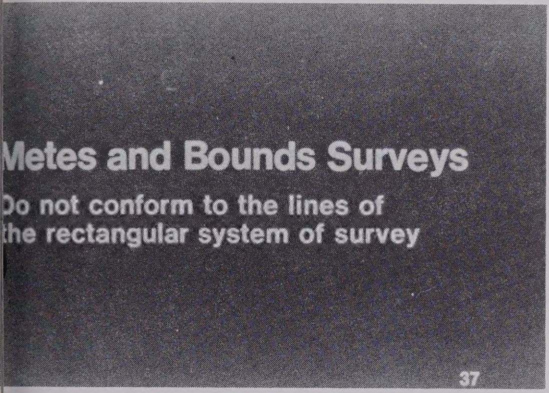
20.13 + 20.00 ÷ 2 = 20.065

20.065 TIMES 17.92 = 359.56

359.56 ÷ 10 = 35.96

BRIEF DEFINITION OF METES AND BOUNDS SURVEYS

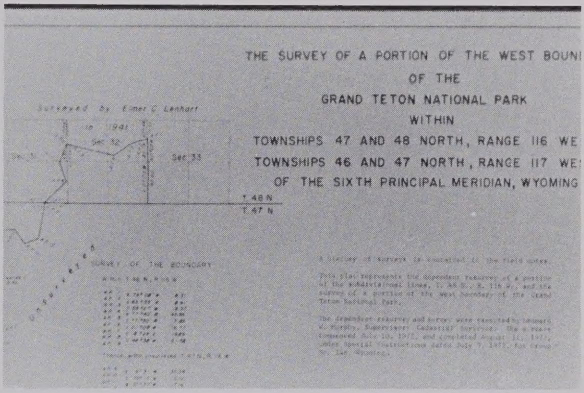
etes and bounds surveys are necessary for the demarcation of areas not onformable to the rectangular system.



Metes and Bounds Surveys

Do not conform to the lines of the rectangular system of survey

37



THE SURVEY OF A PORTION OF THE WEST BOUN
OF THE
GRAND TETON NATIONAL PARK
WITHIN
TOWNSHIPS 47 AND 48 NORTH, RANGE 116 WE
TOWNSHIPS 46 AND 47 NORTH, RANGE 117 WE
OF THE SIXTH PRINCIPAL MERIDIAN, WYOMING

EXERCISE NO. 18

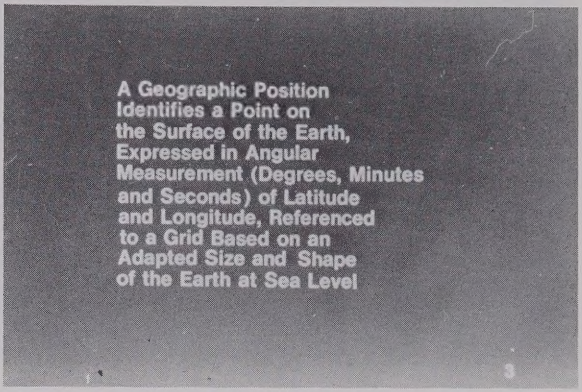
xplain the term "metes and bounds survey".

Answers to Exercise No. 18

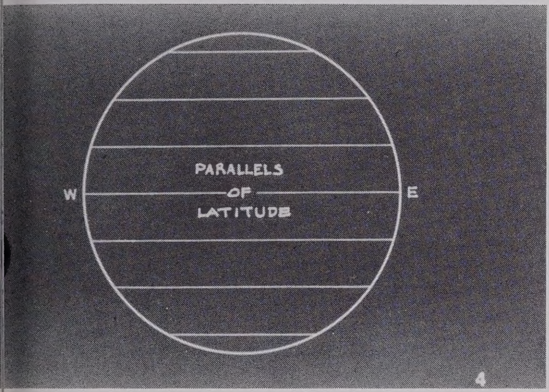
Metes and bounds surveys are necessary for defining the boundaries of areas of land which are not conformable to the rectangular system of surv Some examples are: mineral claims, small-holding claims, private land g forest-entry claims, national parks, trade and manufacturing sites.

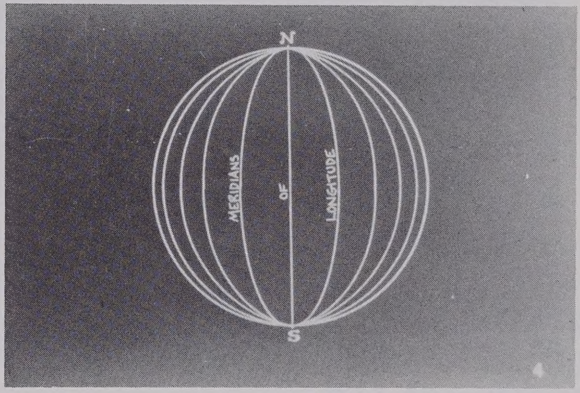
Geographic Locationing

EEL EIGHT

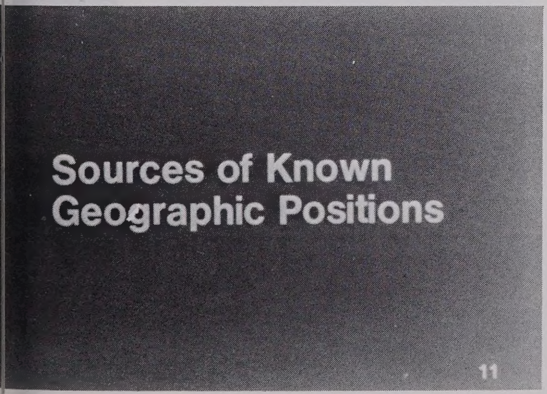

A Geographic Position Identifies a Point on the Surface of the Earth, Expressed in Angular Measurement (Degrees, Minutes and Seconds) of Latitude and Longitude, Referenced to a Grid Based on an Adapted Size and Shape of the Earth at Sea Level

he equator is the origin for lati-
ude, north or south; the Prime
eridian, through Greenwich,
ngland, is the origin for longi-
ude, east or west.





atitudes increase going north or south from the equator; longitudes ncrease going east or west from the Prime Meridian.

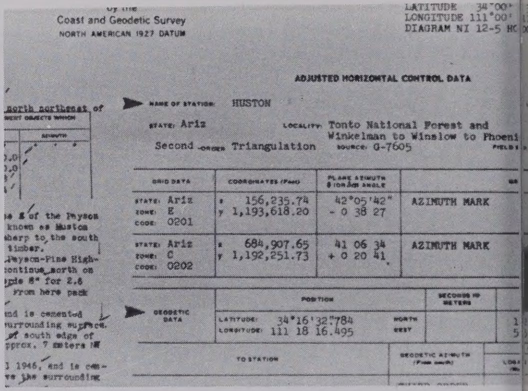

Sources of Known Geographic Positions

Maps and monuments are the two avenues of information for finding geographic values for points on the earth's land surface.

Monuments

The file data for established monuments can usually be easily obtained.

Horizontal Control Data



Coast and Geodetic Survey
NORTH AMERICAN 1927 DATUM

LATITUDE 34°00'
LONGITUDE 111°00'
DIAGRAM NI 12-5

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HUSTON

STATE: Ariz LOCALITY: Tonto National Forest and Winkelman to Winslow to

Second ORDER Triangulation SOURCE: G-7605

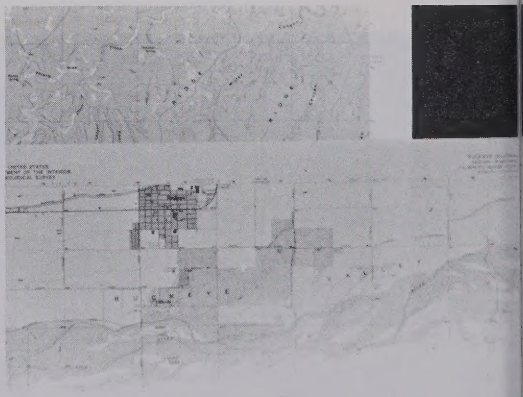
GRID DATA	COORDINATES (FEET)	PLANE AZIMUTH OR ANGLE	
STATE: Ariz ZONE: E CODE: 0201	x 156,235.74 y 1,193,618.20	42°05'42" - 0 38 27	AZIMUTH MARK
STATE: Ariz ZONE: C CODE: 0202	x 684,907.65 y 1,192,251.73	41 06 34 + 0 20 41	AZIMUTH MARK

GEODETIC DATA	POSITION		SECONDS IN METERS
	LATITUDE: 34°16'32".784	NORTH	
	LONGITUDE: 111 18 16.495	WEST	

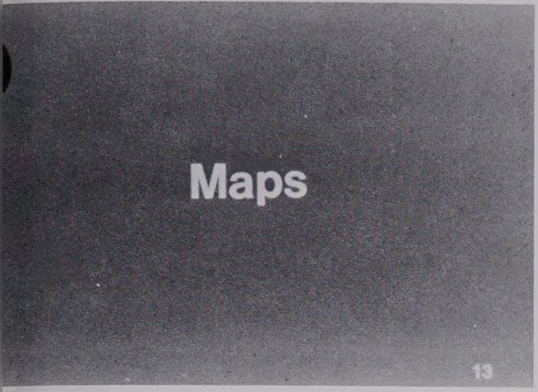
TO STATION | GEODETIC AZIMUTH

The stated geographic position for many monuments is very accurate.

Maps

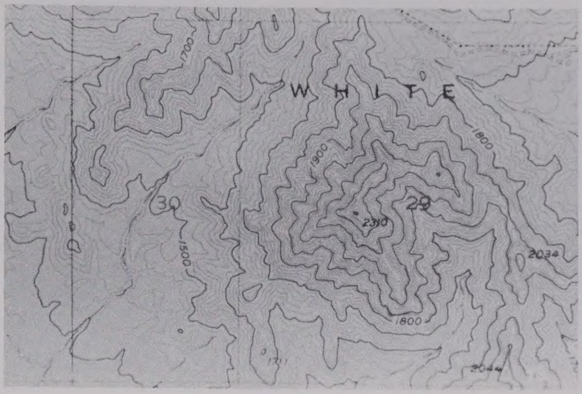


Generally less accurate geographic positioning can be obtained from map scaling.



Maps

13



f course, meaningful map scaling requires a map of reasonable reliability
nd feature depiction.

BLM Library
Denver Federal Center
Bldg. 85, OC-521
P.O. Box 25047
Denver, CO 80225

EXERCISE NO. 19

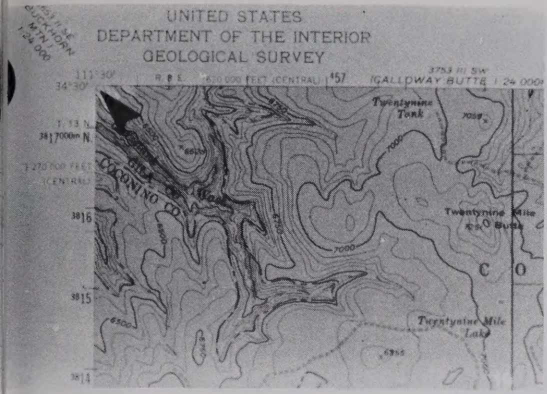
What are the two primary sources of information available for determining the geographic position of known points?

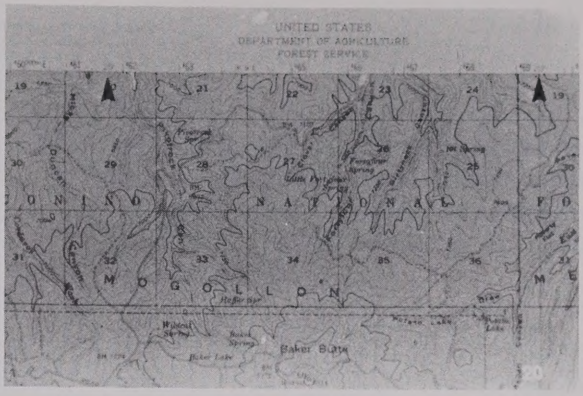
Which of the above is usually the most accurate?

Answers to Exercise No. 19

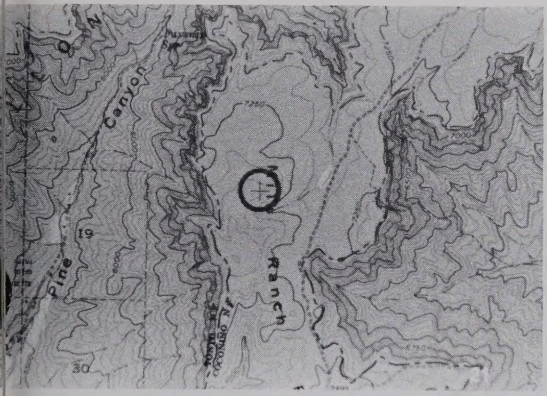
1) Maps, and horizontal control data files of monumented points.

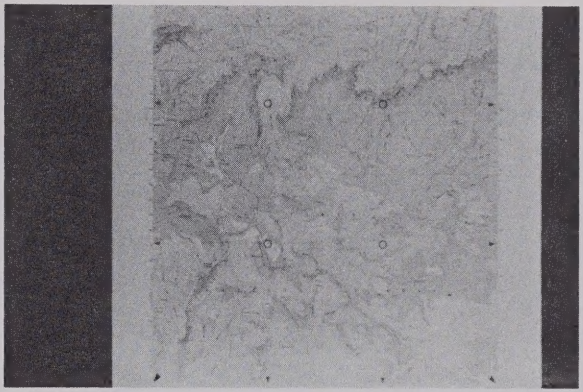
2) Horizontal control data. For example, data published by the National Geodetic Survey will provide the most accurate geodetic positions avai-able to the draftsperson.





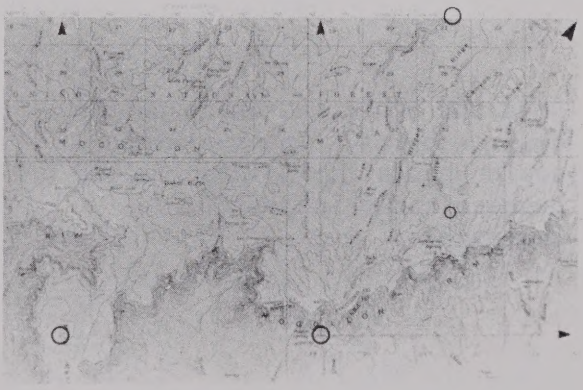
.S.G.S. maps have consistently marked latitude and longitude values on heir borders.



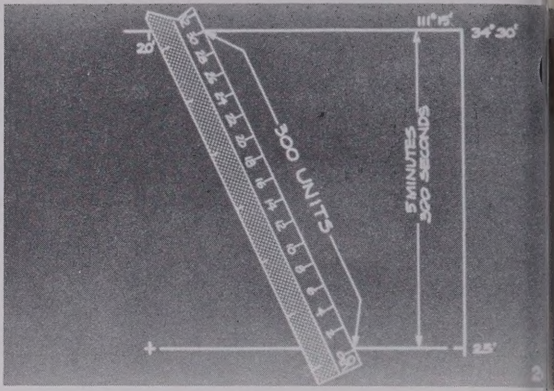


ithin the map itself, black crosses indicate the intersections of the alues given at the border tic marks.

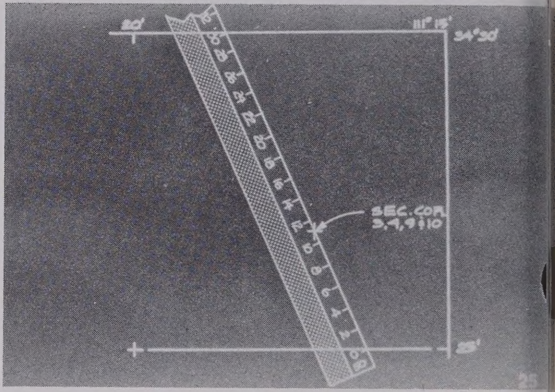
onnect the appropriate tic marks
o the intersection cross with
ine pencil lines. The map area
arked off will then include the
oint to be scaled.



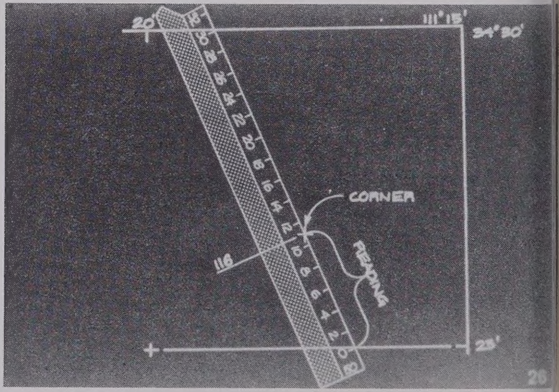
Select a scale with units compatible with the number of seconds between the limiting lines.

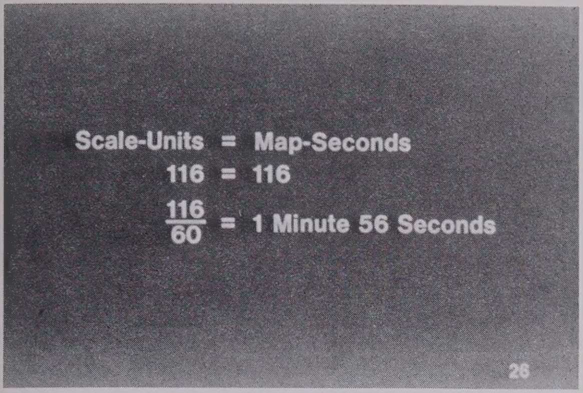


Arrange the scale edge to fit over the desired point with the zero mark of the scale on one of the limiting lines and the upper chosen increment of the scale on the other limiting line.



Read the scale increment of the desired point. Interpolation of scale values for points falling between scale increments is desireable.



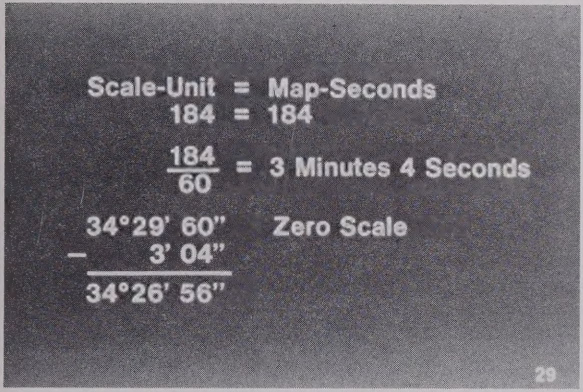


Scale-Units = Map-Seconds

116 = 116

$\frac{116}{60}$ = 1 Minute 56 Seconds

Since you have used a method of scaling which allows direct reading of seconds for the desired point, you now only need to convert the found seconds to minutes and seconds.



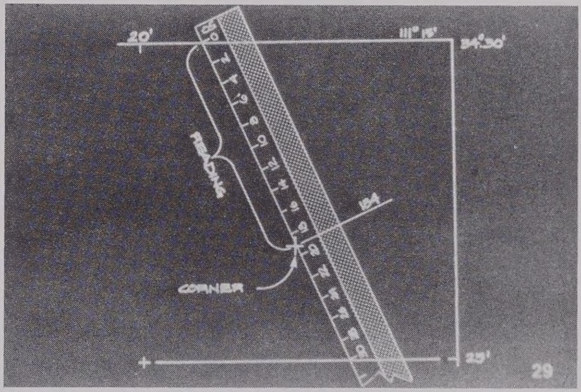
Scale-Unit = Map-Seconds

184 = 184

$\frac{184}{60}$ = 3 Minutes 4 Seconds

$$\begin{array}{r} 34°29'\ 60'' \\ -\quad 3'\ 04'' \\ \hline 34°26'\ 56'' \end{array}$$

Zero Scale



Finally, add or subtract the scaled minutes and seconds to the value of the latitudinal or longitudinal limiting lines. Add if the zero increment of the scale was placed on the south most or east most limiting line. Subtract if the reverse orientation was used.

Using the KEHL RIDGE QUADRANGLE, ARIZONA, scale the following points:

a) The corner of Sections 2, 3, 10, and 11,
T. 12 N., R. 10 E.

b) The WC corner between Secs. 9 and 10,
T. 12 N., R. 10 E.

c) The 1/4 corner for Sec. 36 only,
T. 13 N., R. 9 E.

d) The 1/4 corner between Secs. 32 and 33,
T. 12 N., R. 10 E

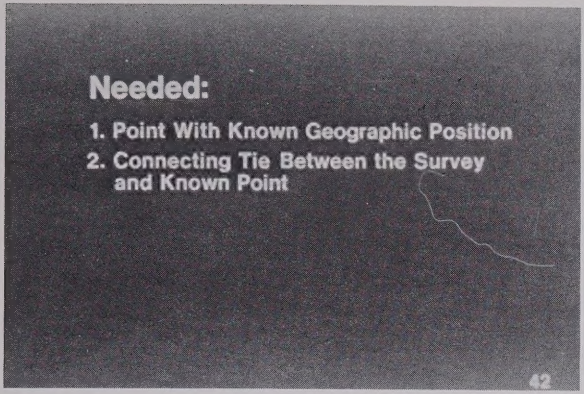
Answers to Exercise No. 20

a) 34° 26' 55" N
111° 16' 27" W

b) 34° 26' 16" N
111° 17' 30" W

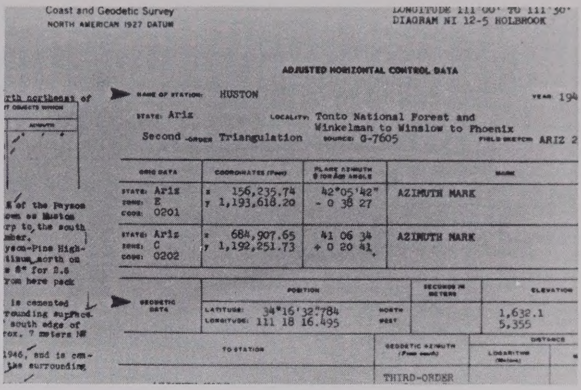
c) 34° 27' 48" N
111° 20' 46" W

d) 34° 22' 57" N
111° 18' 34" W



Needed:

1. Point With Known Geographic Position
2. Connecting Tie Between the Survey and Known Point



Coast and Geodetic Survey
NORTH AMERICAN 1927 DATUM

LONGITUDE 111°00' TO 111°30'
DIAGRAM NI 12-5 HOLBROOK

ADJUSTED HORIZONTAL CONTROL DATA

NAME OF STATION: HUSTON
YEAR: 194
STATE: Ariz
LOCALITY: Tonto National Forest and Winkelman to Winslow to Phoenix
Second -ORDER Triangulation
SOURCE: G-7605
FIELD SKETCH: ARIZ 2

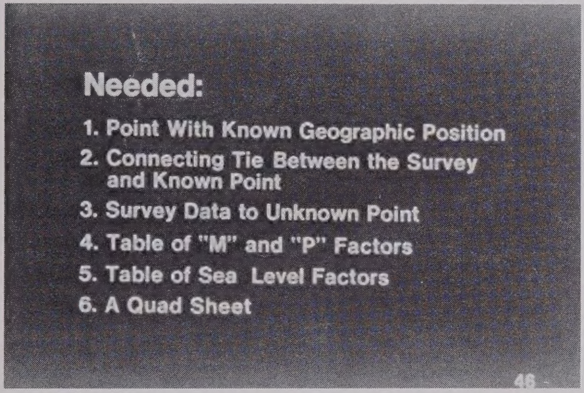
GRID DATA	COORDINATES (Feet)	PLANE AZIMUTH θ OR Δα ANGLE	MARK
STATE: Ariz ZONE: E CODE: 0201	x 156,235.74 y 1,193,618.20	42°05'42" - 0 38 27	AZIMUTH MARK
STATE: Ariz ZONE: C CODE: 0202	x 684,907.65 y 1,192,251.73	41 06 34 + 0 20 41	AZIMUTH MARK

GEODETIC DATA	POSITION		SECONDS IN METERS	ELEVATION
	LATITUDE: 34°16'32".784	NORTH		1,632.1
	LONGITUDE: 111 18 16.495	WEST		5,355

TO STATION	GEODETIC AZIMUTH (From south)	DISTANCE LOGARITHM (Meters)
	THIRD-ORDER	

rth northeast of
of the Payson
own as Huston
rp to the south
mber.
yson-Pine High-
tinum north on
for 2.8
rom here peak
is cemented
rounding surface
south edge of
rox. 7 meters NW
1946, and is com-
the surrounding

Geographic coordinate computations for a series of survey stations must begin at a monumented position for which geographic coordinates are known.



Needed:

1. Point With Known Geographic Position
2. Connecting Tie Between the Survey and Known Point
3. Survey Data to Unknown Point
4. Table of "M" and "P" Factors
5. Table of Sea Level Factors
6. A Quad Sheet

The other reference sources needed are the bearings and distances of the field survey data, M and P factors, sea level factors, and - solely for elevation information - an accurate topographic map.

EXERCISE NO. 21

The geographic position of a section corner is to be determined from a series of field ties to a U.S.C. & G.S. monumented station.

Underline the statements below which are directly related to converting the latitude and longitude of the station to a latitude and longitude for the section corner.

ephemeris

"M" and "P" factors

table of sea level factors

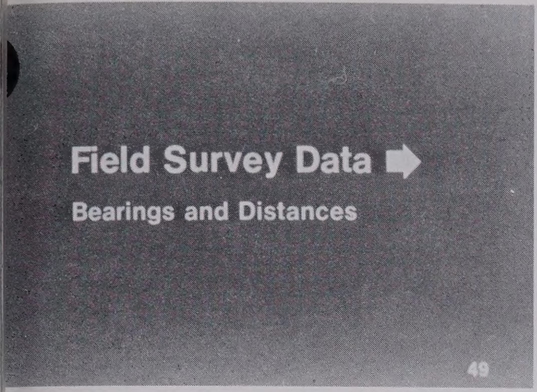
published N.G.S. data

series of bearings and distances from the section corner to the station

State plane-coordinates

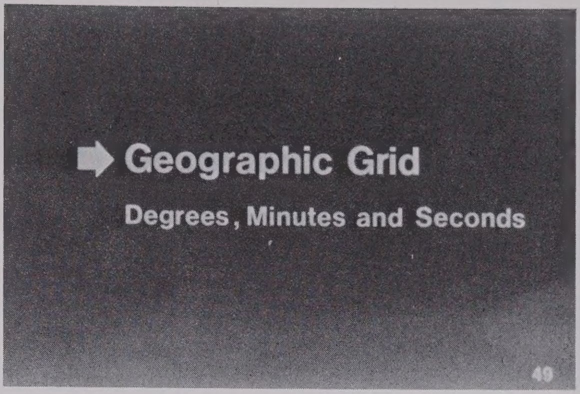
Answers to Exercise No. 21

"Ephemeris" and "State plane coordinates" should not be underlined. Although these two items can be related to determining geographic position, they are not necessary for the information and method needed in our office calculations.



Field Survey Data ➡

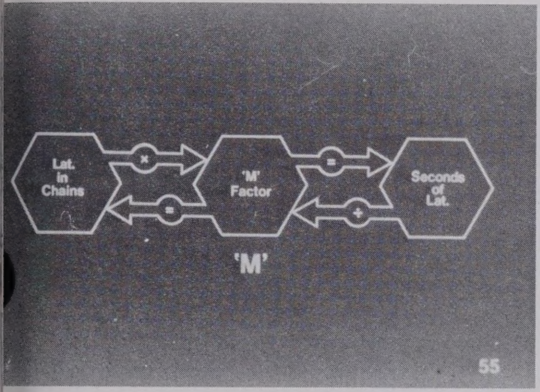
Bearings and Distances

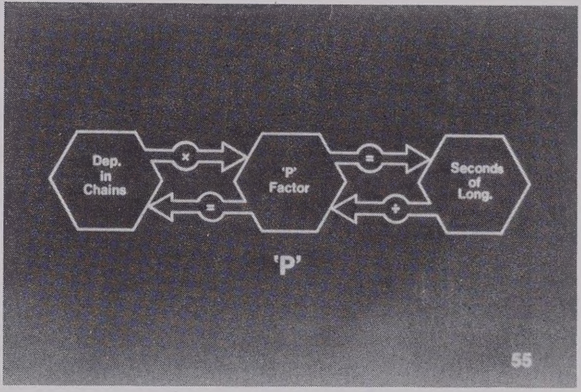


➡ Geographic Grid

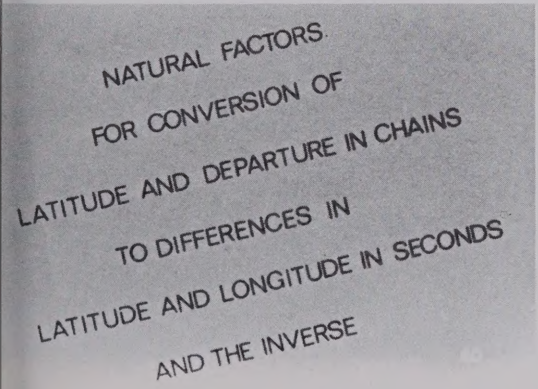
Degrees, Minutes and Seconds

e basic problem is to convert survey data to values of latitude and ngitude.

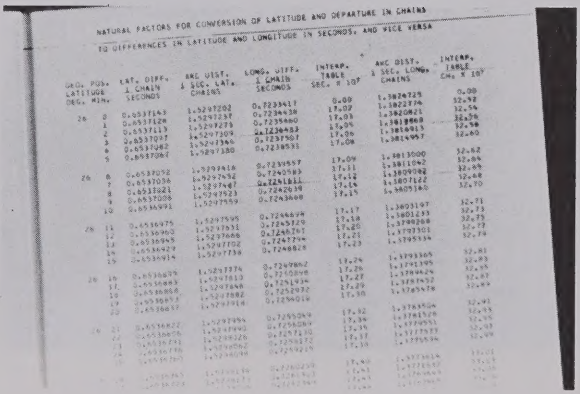




factors are used to convert distances along meridians (latitudinal stances) to angular values; P factors are used to convert distances along rallels (departure distances) to angular values. Note: The cadastral rvey convention used here refers to measured survey distance along north-uth lines as latitude (not the same as geographic latitude), and the meas-ed survey distance along east-west lines as departure.

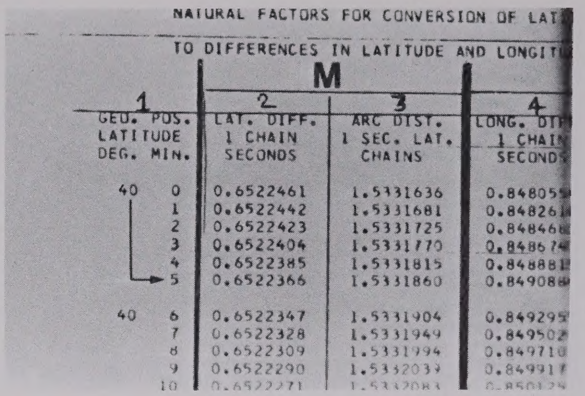


NATURAL FACTORS
FOR CONVERSION OF
LATITUDE AND DEPARTURE IN CHAINS
TO DIFFERENCES IN
LATITUDE AND LONGITUDE IN SECONDS
AND THE INVERSE



NATURAL FACTORS FOR CONVERSION OF LATITUDE AND DEPARTURE IN CHAINS TO DIFFERENCES IN LATITUDE AND LONGITUDE IN SECONDS, AND VICE VERSA

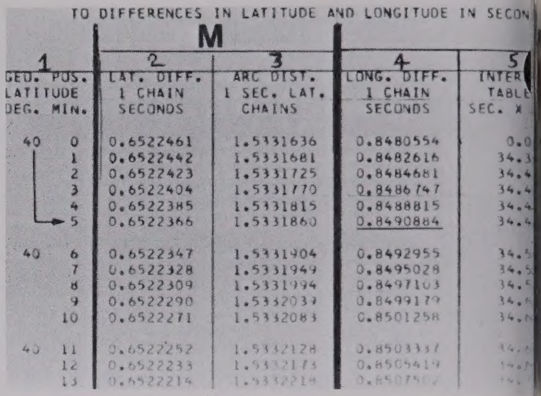
the BLM pamphlet of M and P factors, the factors are given for each one nute of geographic latitude. Geographic latitude, then, will be our itial reference in finding the particular M or P factor.



NATURAL FACTORS FOR CONVERSION OF LAT

TO DIFFERENCES IN LATITUDE AND LONGIT

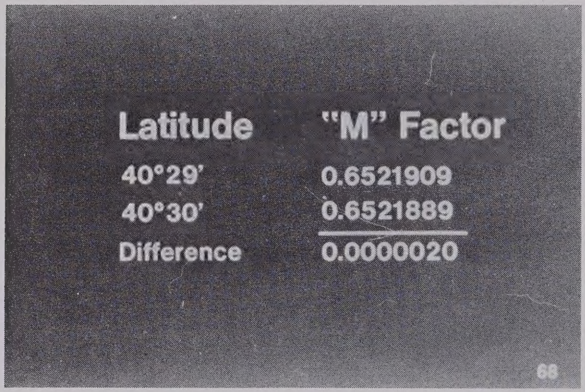
1	M		
	2	3	4
GEO. POS. LATITUDE DEG. MIN.	LAT. DIFF. 1 CHAIN SECONDS	ARC DIST. 1 SEC. LAT. CHAINS	LONG. DI 1 CHAI SECOND
40 0	0.6522461	1.5331636	0.84805
1	0.6522442	1.5331681	0.84826
2	0.6522423	1.5331725	0.84846
3	0.6522404	1.5331770	0.84867
4	0.6522385	1.5331815	0.84888
5	0.6522366	1.5331860	0.84908
40 6	0.6522347	1.5331904	0.849295
7	0.6522328	1.5331949	0.84950
8	0.6522309	1.5331994	0.84971
9	0.6522290	1.5332039	0.84991
10	0.6522271	1.5332083	0.85012



TO DIFFERENCES IN LATITUDE AND LONGITUDE IN SECON

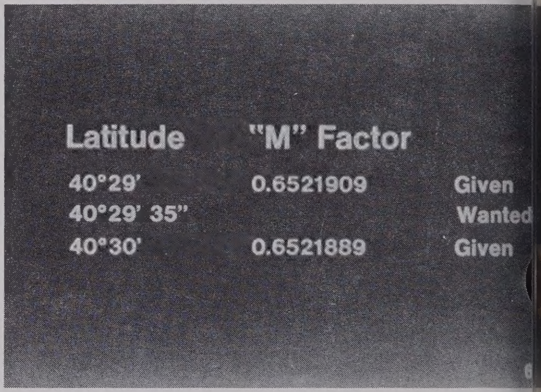
1	M			
	2	3	4	5
GEO. POS. LATITUDE DEG. MIN.	LAT. DIFF. 1 CHAIN SECONDS	ARC DIST. 1 SEC. LAT. CHAINS	LONG. DIFF. 1 CHAIN SECONDS	INTER TABLE SEC. X
40 0	0.6522461	1.5331636	0.8480554	0.0
1	0.6522442	1.5331681	0.8482616	34.3
2	0.6522423	1.5331725	0.8484681	34.4
3	0.6522404	1.5331770	0.8486747	34.4
4	0.6522385	1.5331815	0.8488815	34.4
5	0.6522366	1.5331860	0.8490884	34.4
40 6	0.6522347	1.5331904	0.8492955	34.5
7	0.6522328	1.5331949	0.8495028	34.5
8	0.6522309	1.5331994	0.8497103	34.5
9	0.6522290	1.5332039	0.8499179	34.
10	0.6522271	1.5332083	0.8501258	34.
40 11	0.6522252	1.5332128	0.8503337	34.
12	0.6522233	1.5332173	0.8505419	34.
13	0.6522214	1.5332218	0.85075	[illegible]

Finding the appropriate M or P factor of a particular geographic latitude which is given to the nearest even minute is simple.



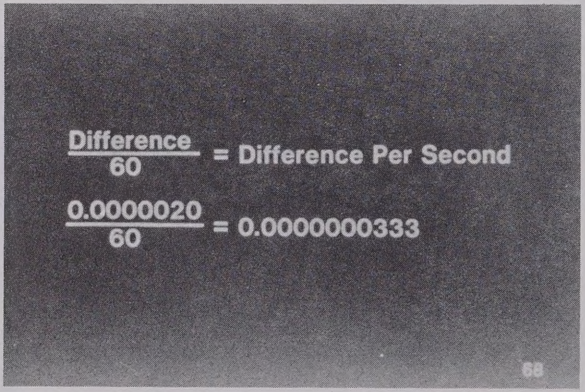
Latitude	"M" Factor
40°29'	0.6521909
40°30'	0.6521889
Difference	0.0000020

68



Latitude	"M" Factor	
40°29'	0.6521909	Given
40°29' 35"		Wanted
40°30'	0.6521889	Given

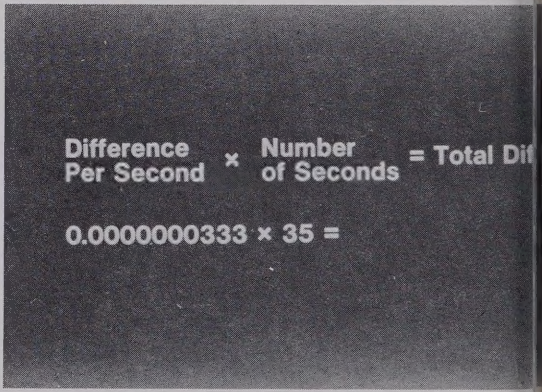
To interpolate M factors for geographic latitudes given in seconds, first, obtain the nearest given M factor values on both sides of the unknown valu, and subtract one from the other.



$\frac{\text{Difference}}{60}$ = Difference Per Second

$\frac{0.0000020}{60}$ = 0.0000000333

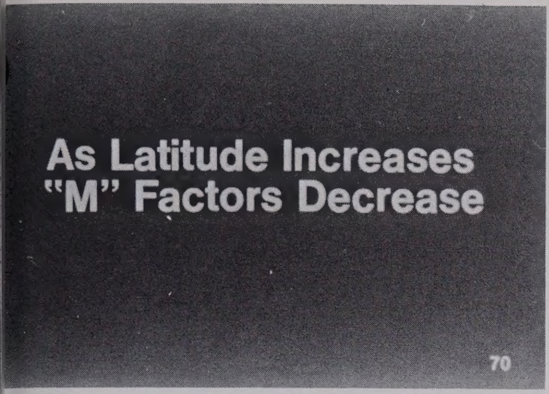
68



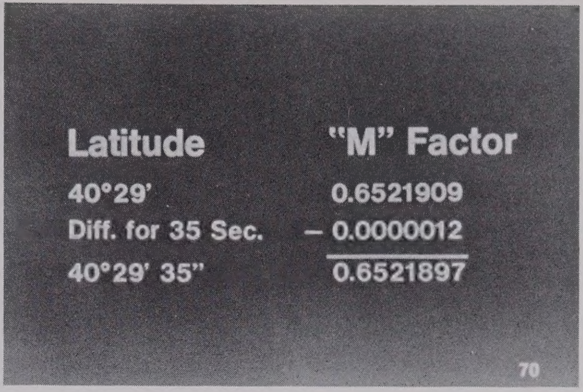
Difference Per Second × Number of Seconds = Total Dif

0.0000000333 × 35 =

Then, divide this difference by 60, and multiply the result by the number of seconds being interpolated for, in this case 35 seconds, to obtain the proportionate part.

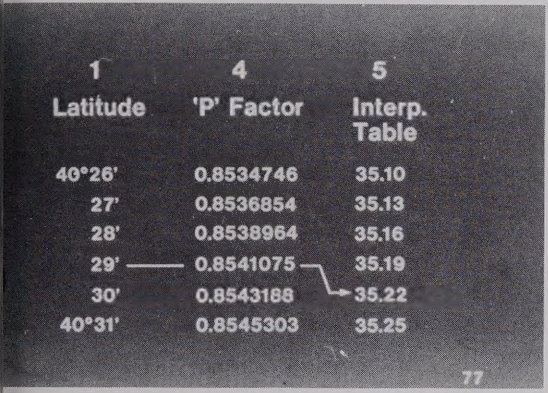


As Latitude Increases
"M" Factors Decrease



Latitude	"M" Factor
40°29'	0.6521909
Diff. for 35 Sec.	– 0.0000012
40°29' 35"	0.6521897

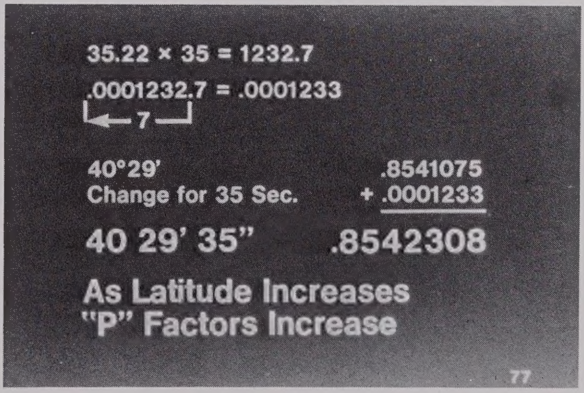
ince M factors decrease as geographic latitude increases, subtract the roportionate part value from the given higher valued M factor to obtain he interpolated M factor.



1 Latitude	4 'P' Factor	5 Interp. Table
40°26'	0.8534746	35.10
27'	0.8536854	35.13
28'	0.8538964	35.16
29'	0.8541075	35.19
30'	0.8543188	35.22
40°31'	0.8545303	35.25

An interpolation column is given in the tables for P factors; it is only necessary to get this interpolation value for the higher geographic minute...

nd multiply it times the number f seconds being interpolated for; hen, move the decimal of the reult seven places to the left to btain the proportionate part.



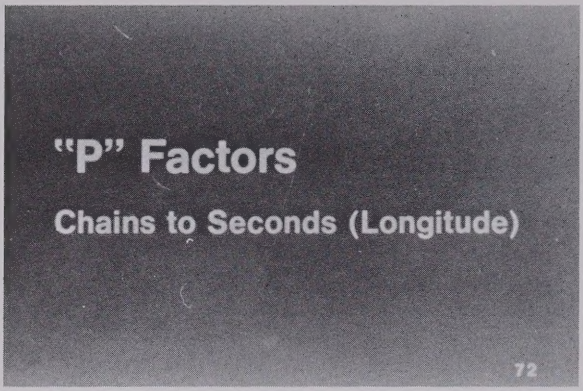
35.22 × 35 = 1232.7

.0001232.7 = .0001233

7

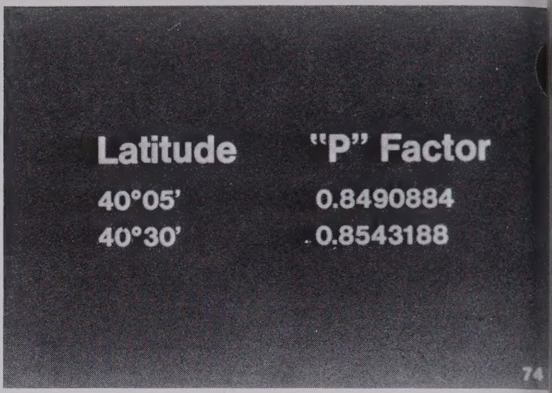
40°29'	.8541075
Change for 35 Sec.	+ .0001233
40 29' 35"	.8542308

As Latitude Increases
"P" Factors Increase



"P" Factors

Chains to Seconds (Longitude)



Latitude	"P" Factor
40°05'	0.8490884
40°30'	0.8543188

Since P factors increase as geographic latitude increases, add the proportionate part value to the given lower valued P factor to obtain the interpolated P factor.

EXERCISE NO. 22

) In examining a table of M and P factors, it is apparent that along any particular parallel of latitude, the factor ("P") for converting increments of distance to increments of degrees, minutes, and seconds is constant. As the latitude numerically increases, the "P" factor also increases.

In your own words, or by using a diagram, show why the above statement is true.

) Strike out the inappropriate phrase or word in the following sentences.

A chain of linear distance along a meridional line near the equator represents (more, less) arc increment than a chain of distance along a meridional line near the north pole. The principle represented by the above statement relates to the earth (not being a perfect sphere, having unequal circles of longitude).

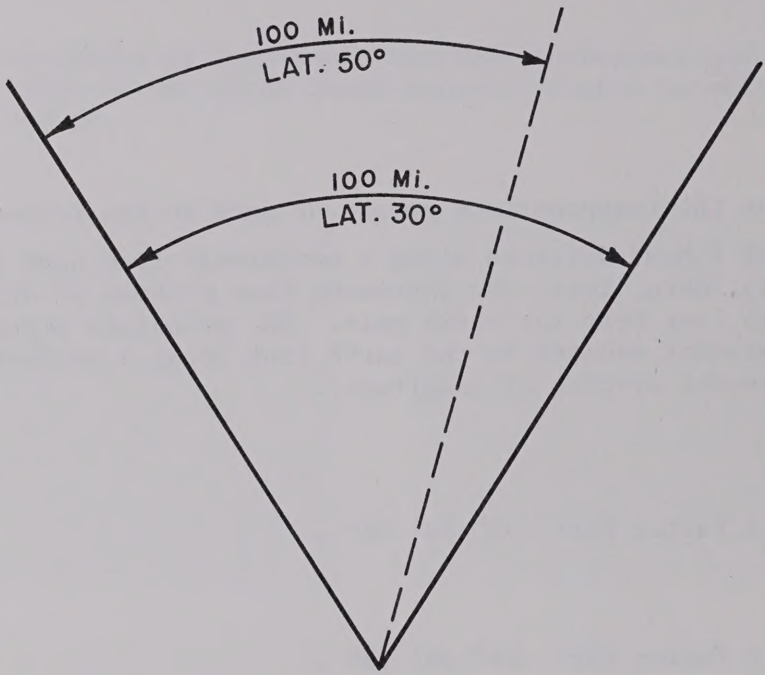
) Find the M factor for: 39° 59' 55" .

) Find the P factor for: 39° 00' 18" .

Answers to Exercise No. 22

1. Here is one line of reasoning:

As latitude increases, the circles representing lines of equal latitud for the earth's reference datum become increasingly smaller. A unit o linear measurement placed coincident with the arc of one of the earth' smaller latitudinal circles represents relatively more arc increment than the same linear measurement placed coincident with an arc of one the earth's larger latitudinal circles.



2. more; not being a perfect sphere.

These are the correct phrases.

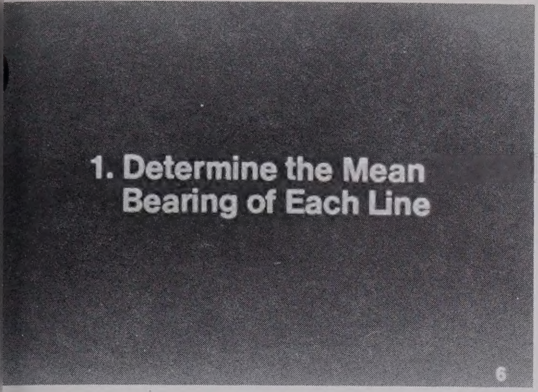
3. .6522463

4. .8360484

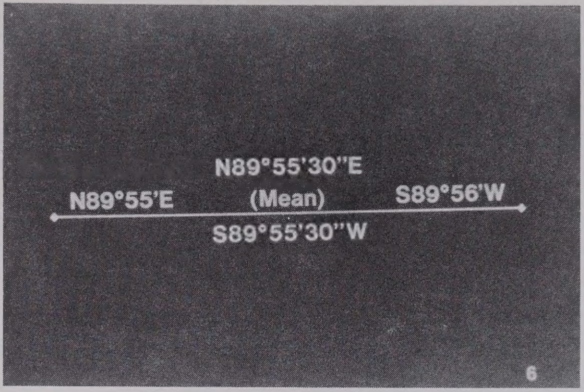
DETERMINING THE MEAN GEOGRAPHIC LATITUDES OF TRAVERSE LINES

NINE

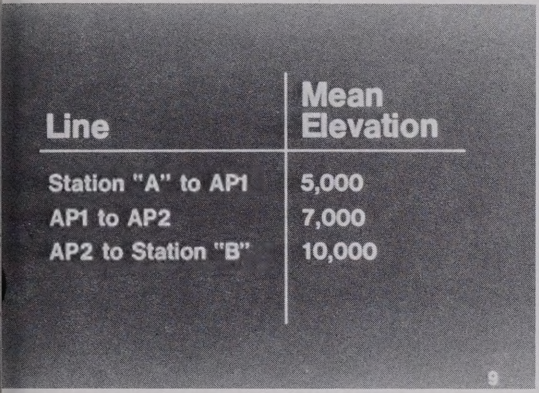
(Starting with a point of known geographic coordinates)



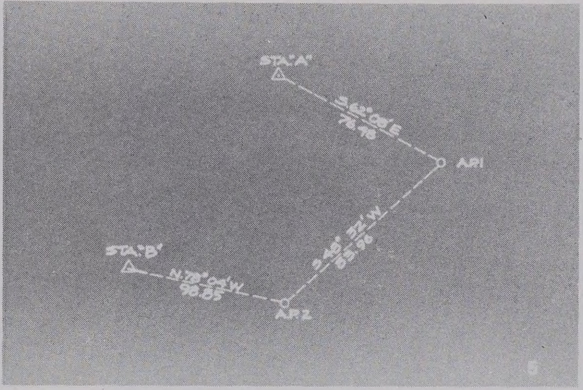
1. Determine the Mean Bearing of Each Line



ost of the survey data that the draftsperson will be computing with will be ven in mean bearings. If bearings are given at the end of each traverse ne, merely find their mean by the method given in Exercise No. 6.



Line	Mean Elevation
Station "A" to AP1	5,000
AP1 to AP2	7,000
AP2 to Station "B"	10,000



he next step is to reduce the length of each traverse line to sea level stance. Mean elevations for each line can usually be approximated from pographic maps.

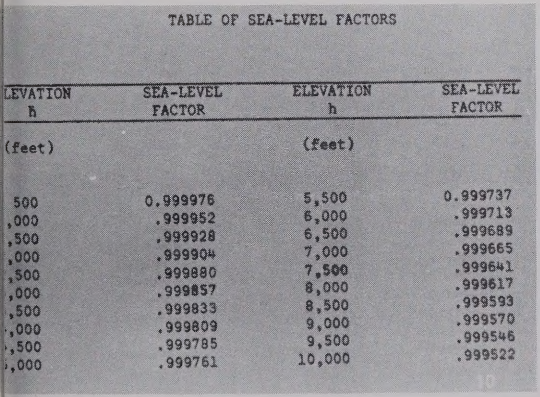
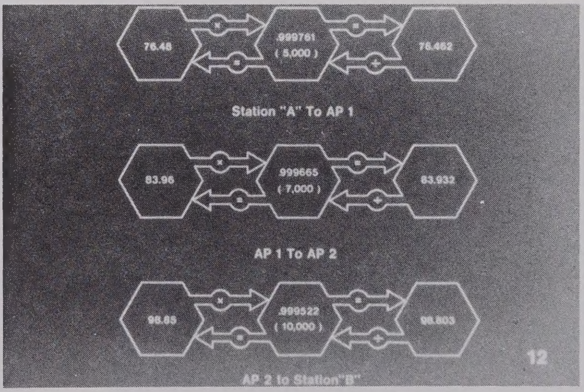
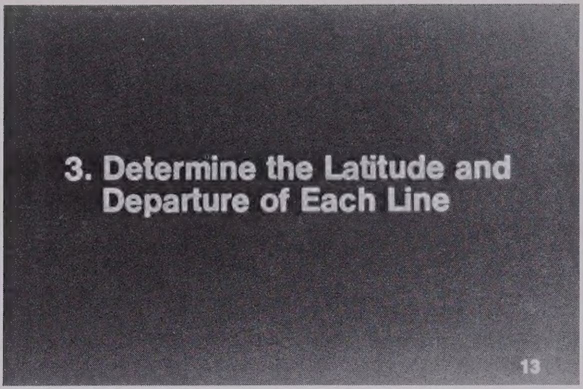


TABLE OF SEA-LEVEL FACTORS

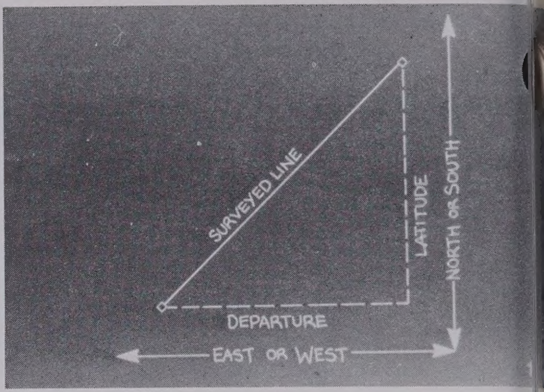
LEVATION h (feet)	SEA-LEVEL FACTOR	ELEVATION h (feet)	SEA-LEVEL FACTOR
500	0.999976	5,500	0.999737
,000	.999952	6,000	.999713
,500	.999928	6,500	.999689
,000	.999904	7,000	.999665
,500	.999880	7,500	.999641
,000	.999857	8,000	.999617
,500	.999833	8,500	.999593
,000	.999809	9,000	.999570
,500	.999785	9,500	.999546
,000	.999761	10,000	.999522



imply multiply each sea level factor times the measured survey distance.

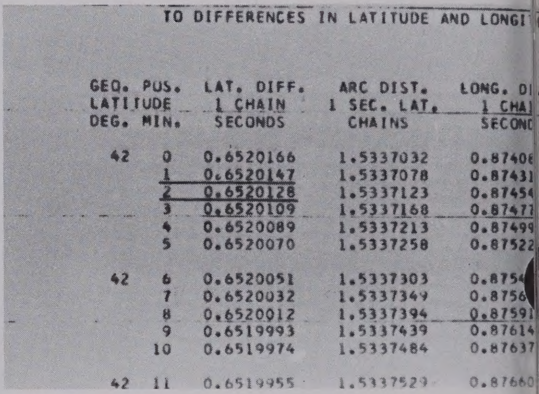


3. Determine the Latitude and Departure of Each Line



Then, break down each sea level distance to its respective latitude and departure...

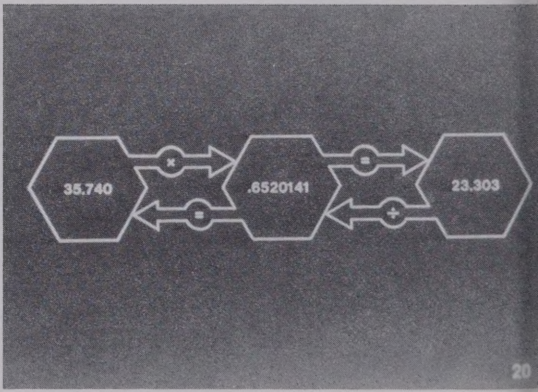
Find the M factor for the initial point...



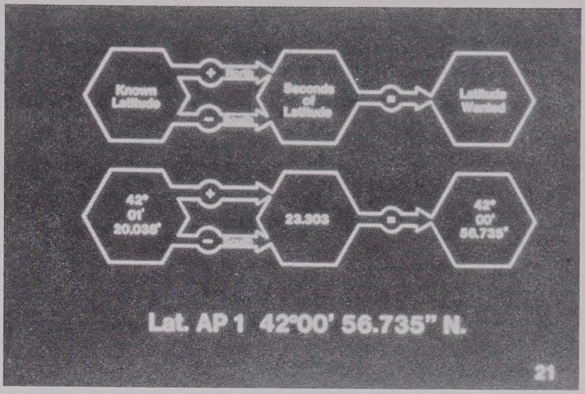
TO DIFFERENCES IN LATITUDE AND LONGI

GEO. POS. LATITUDE DEG.	MIN.	LAT. DIFF. 1 CHAIN SECONDS	ARC DIST. 1 SEC. LAT. CHAINS	LONG. D 1 CHA SECON
42	0	0.6520166	1.5337032	0.8740
	1	0.6520147	1.5337078	0.8743
	2	0.6520128	1.5337123	0.8745
	3	0.6520109	1.5337168	0.8747
	4	0.6520089	1.5337213	0.87499
	5	0.6520070	1.5337258	0.87522
42	6	0.6520051	1.5337303	0.8754
	7	0.6520032	1.5337349	0.8756
	8	0.6520012	1.5337394	0.8759
	9	0.6519993	1.5337439	0.87614
	10	0.6519974	1.5337484	0.87637
42	11	0.6519955	1.5337529	0.87660

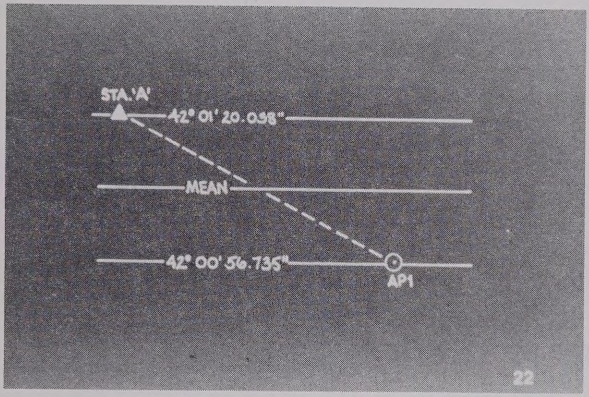
Multiply this M factor times the first line's latitude in chains, which you have already computed...

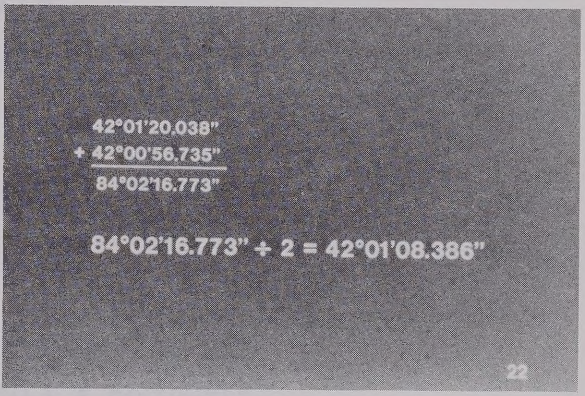


Add or subtract these computed seconds of latitude to the initial point geographic latitude, depending on whether the successive point is north or south of the initial point...



Lat. AP 1 42°00' 56.735" N.

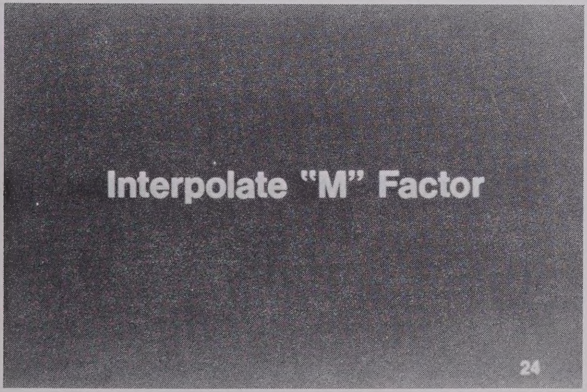




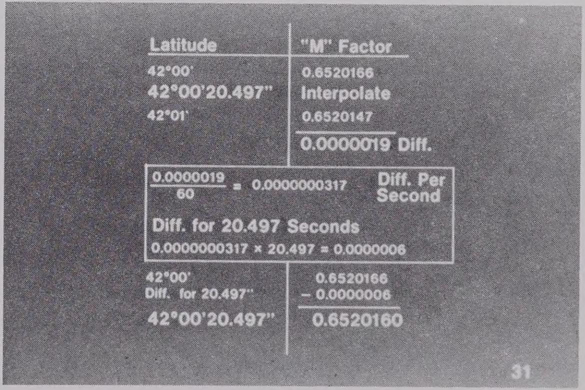
42°01'20.038"
+ 42°00'56.735"
84°02'16.773"

84°02'16.773" ÷ 2 = 42°01'08.386"

The geographic latitudes of the successive point and the initial point added together and divided by two then gives the mean geographic latitude of the surveyed line.



Interpolate "M" Factor



Latitude	"M" Factor
42°00'	0.6520166
42°00'20.497"	Interpolate
42°01'	0.6520147
	0.0000019 Diff.

$\frac{0.0000019}{60}$ = 0.0000000317 Diff. Per Second

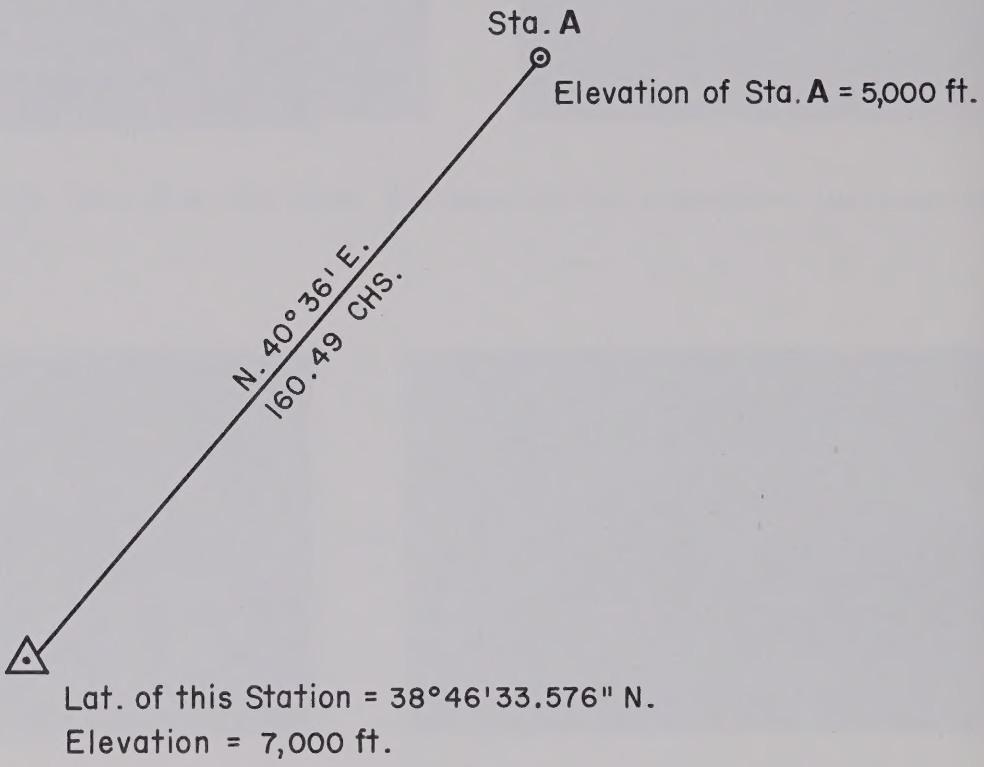
Diff. for 20.497 Seconds

0.0000000317 × 20.497 = 0.0000006

42°00' Diff. for 20.497"	0.6520166 − 0.0000006
42°00'20.497"	0.6520160

To continue the process for successive traverse lines, interpolate M factors for the computed geographic latitudes of each end point, and employ the steps just outlined.

1) Define and differentiate between the terms "Traverse Latitude" and "Geographic Latitude".


Sta. **A**
Elevation of Sta. **A** = 5,000 ft.
N. 40° 36' E.
160.49 CHS.
Lat. of this Station = 38°46'33.576" N.
Elevation = 7,000 ft.

2) Determine the mean geographic latitude of the line for the survey data given above.

Answers to Exercise No. 23

1) The latitude of a traverse line (also called traverse leg or course) is the value, on the North - South axis of the vector quantity of the particular course. A geographic latitude is the North - South coordinate, measured from the equator, of a point.

2) The mean elevation of this line is

$$\begin{array}{rr} 7000 & \\ -5000 & \\ \cline{1-1} 2000 \div 2 = & 1000 \\ & +5000 \\ \cline{2-2} & 6000 \text{ Ft.} \end{array}$$

The sea level factor from the M & P factor tables for 6000 ft. = .999713

$(.999713)\ (160.49 \text{ CHS.}) = 160.444 \text{ CHS.}$

$(160.444 \text{ CHS.})\ (\text{COS } 40^\circ 36') = 121.821 \text{ CHS. of LAT.}$

The interpolated M factor for $38^\circ 46' 33.576'' = .6523852$

$(.6523852)\ (121.821) = 01'\ 19.474''$ of geographic latitude between the two stations

$$\begin{array}{rrrl} & 38^\circ & 46' & 33.576'' \\ + & & 01' & 19.474'' \\ \hline & 38^\circ & 47' & 53.050'' \end{array}$$

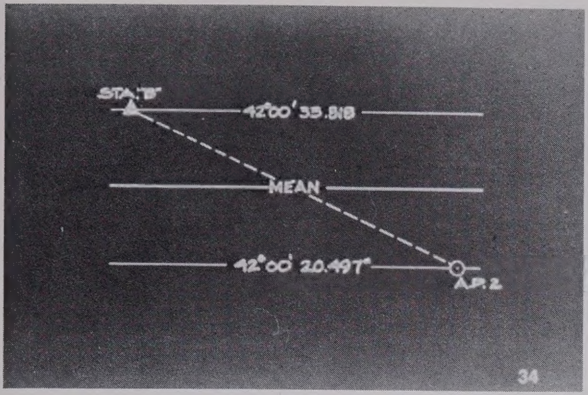
geographic latitude at station A - additon of 01' 19.474", because station A is north of the known station

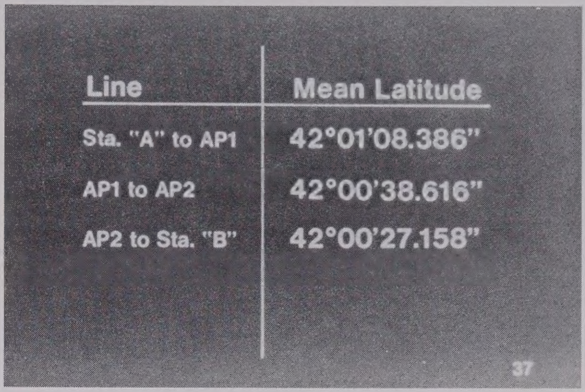
$$\begin{array}{rrrl} & 38^\circ & 47' & 53.050'' \\ + & 38^\circ & 46' & 33.576'' \\ \hline & 76^\circ & 93' & 86.626'' \div 2 = 38^\circ\ 47'\ 13.313'' \end{array}$$

the mean latitude between the two stations

For determining the mean geographic latitudes of successive lines, use the newly calculated geographic position of the terminal point of the previous line, and find the new M factor for this latitudinal value.

Completing the Process of Determining Geographic Position from Field Survey Data

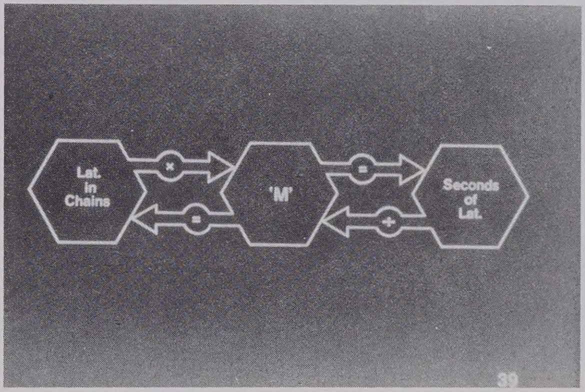




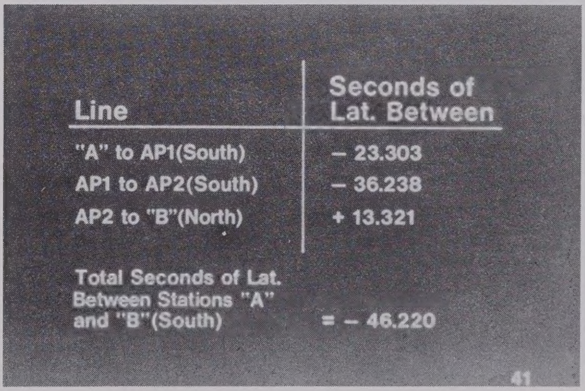
Line	Mean Latitude
Sta. "A" to AP1	42°01'08.386"
AP1 to AP2	42°00'38.616"
AP2 to Sta. "B"	42°00'27.158"

With the mean geographic latitudes of each traverse line determined, the next step is to interpolate an M factor for each of these mean latitudes...

Multiply each M factor times the previously computed latitude, in chains, of each line to arrive at seconds of geographic latitude...

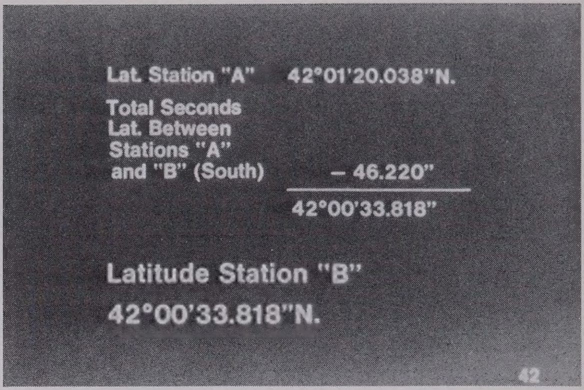


Algebraically total all of the geographic increments; plus for north, minus for south...



Line	Seconds of Lat. Between
"A" to AP1(South)	– 23.303
AP1 to AP2(South)	– 36.238
AP2 to "B"(North)	+ 13.321
Total Seconds of Lat. Between Stations "A" and "B"(South)	= – 46.220

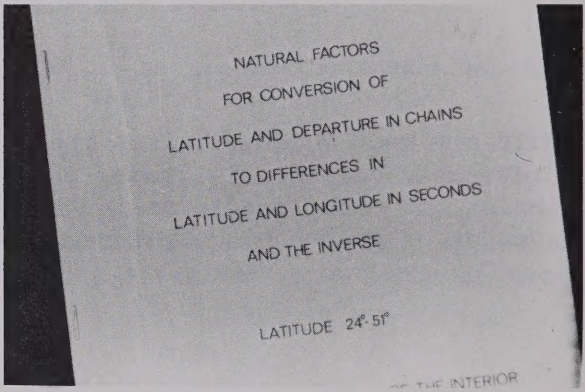
And appropriately add or subtract the result to the initial point's geographic latitude to arrive at the final geographic latitude for the terminal point.



Lat. Station "A"	42°01'20.038"N.
Total Seconds Lat. Between Stations "A" and "B" (South)	− 46.220"
	42°00'33.818"

Latitude Station "B"
42°00'33.818"N.

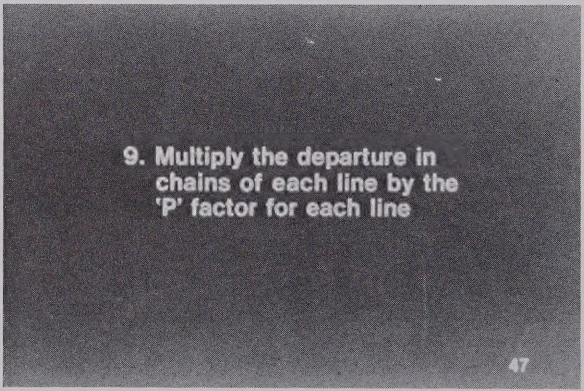
To compute longitude, first, interpolate a P factor for each mean latitude...



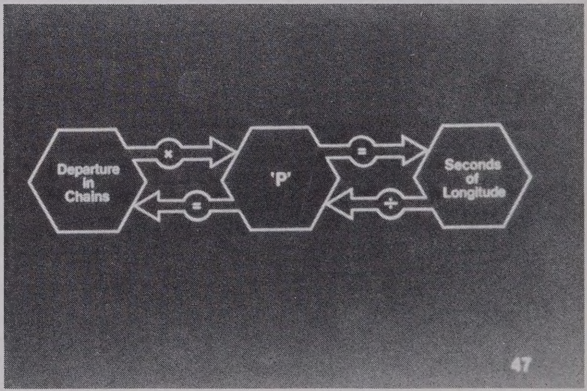
NATURAL FACTORS
FOR CONVERSION OF
LATITUDE AND DEPARTURE IN CHAINS
TO DIFFERENCES IN
LATITUDE AND LONGITUDE IN SECONDS
AND THE INVERSE

LATITUDE 24°-51°

THE INTERIOR



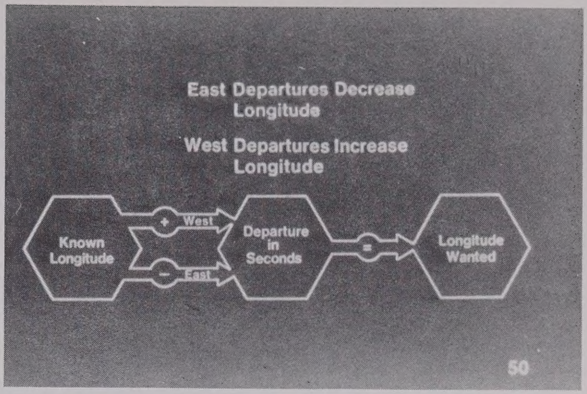
9. Multiply the departure in chains of each line by the 'P' factor for each line



Multiply each P factor times the previously computed departure of each line to arrive at seconds of longitude...

Algebraically total all of the longitudinal increments; plus for west, minus for east.

Note: The sign convention used in the particular calculation process is the reverse of the usual east-west sign convention as used in navigation, geodesy, and surveying.



East Departures Decrease Longitude

West Departures Increase Longitude

Known Longitude

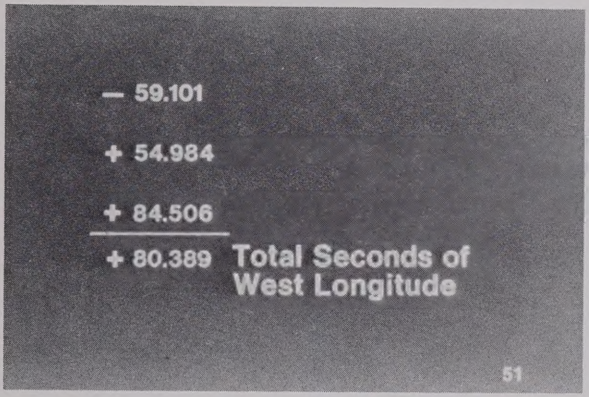
+ West

− East

Departure in Seconds

=

Longitude Wanted

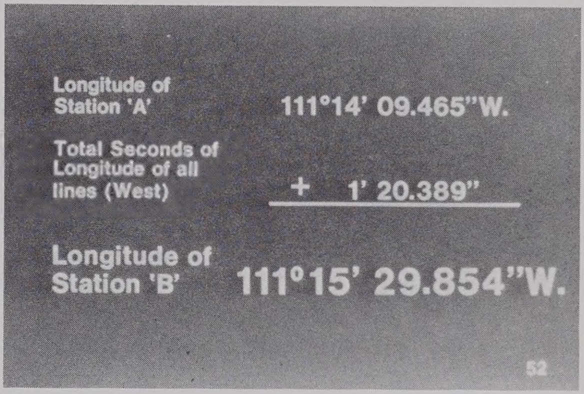


− 59.101

+ 54.984

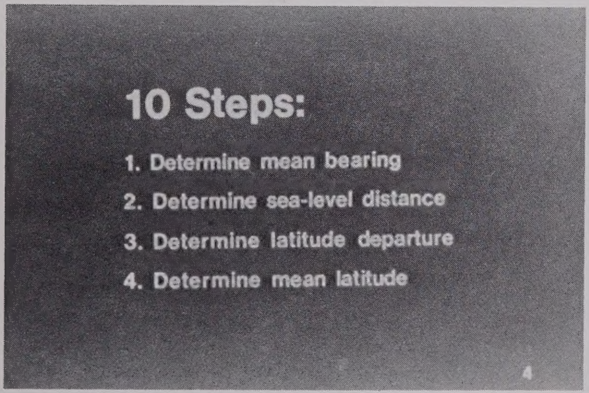
+ 84.506

+ 80.389 Total Seconds of West Longitude



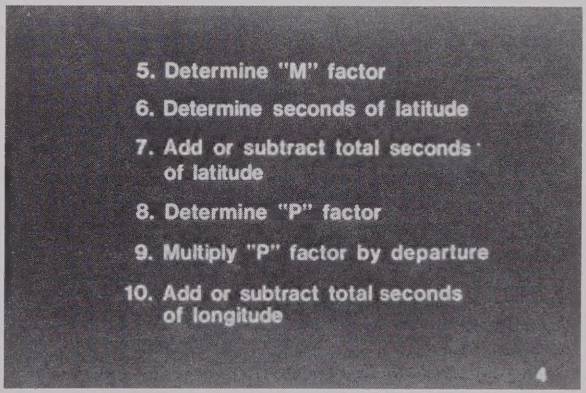
Longitude of Station 'A'	111°14' 09.465"W.
Total Seconds of Longitude of all lines (West)	+ 1' 20.389"
Longitude of Station 'B'	111°15' 29.854"W.

And appropriately add or subtract the result to the initial point's longitude to arrive at the final longitude for the terminal point.



10 Steps:

1. Determine mean bearing
2. Determine sea-level distance
3. Determine latitude departure
4. Determine mean latitude



5. Determine "M" factor
6. Determine seconds of latitude
7. Add or subtract total seconds of latitude
8. Determine "P" factor
9. Multiply "P" factor by departure
10. Add or subtract total seconds of longitude

In review, there are ten steps in determining a geographic position from field survey data.

Note: See the supplemental materials package for a comprehensive listing of the ten steps.

EXERCISE NO. 24

1. After determining the mean latitudes for a series of traverse lines from a point with known geographic coordinates to a terminal point, what are the next steps to be taken in transferring the geographic latitude from the known point to the terminal point?

2. Assume the same information for Problem 1, and also, that the departures for each line have been previously calculated. What are the next steps to be taken in transferring the geographic longitude from the known point to the terminal point?

Answers to Exercise No. 24

1. a) Interpolate the M factors for each mean latitude.

   b) Multiply this M factor times the latitude (chains) difference between each successive point to obtain the arc increments.

   c) Algebraically total the arc increments, i.e., north bearings are + and south bearings are - .

   d) Add or subtract the total amount of arc from the geographic latitu of the beginning point.

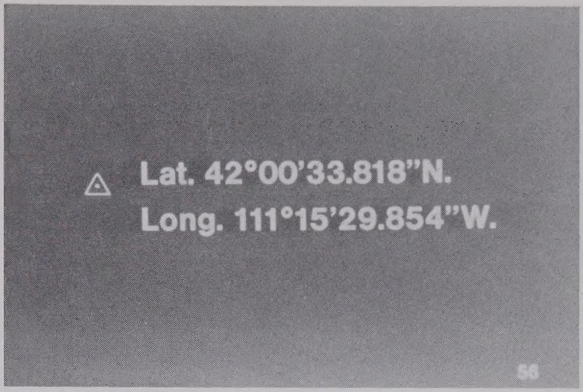
2. a) Interpolate the P factors for each mean latitude.

   b) Multiply this P factor times the departure difference between each successive point to obtain the arc increments.

   c) Algebraically total the arc increments.

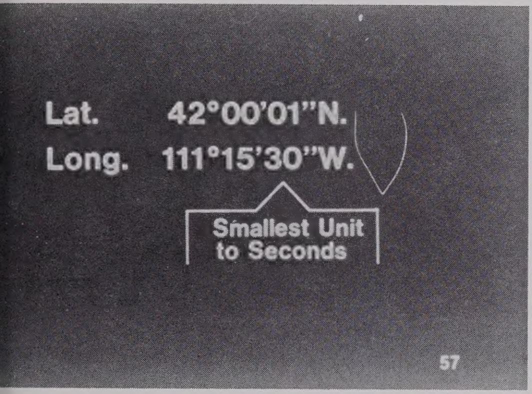
   d) Add or subtract the total amounts of arc from the geographic longitude of the beginning point.

stated geographic position is ly as accurate as the information ed in computing it.



△ Lat. 42°00'33.818"N.
Long. 111°15'29.854"W.

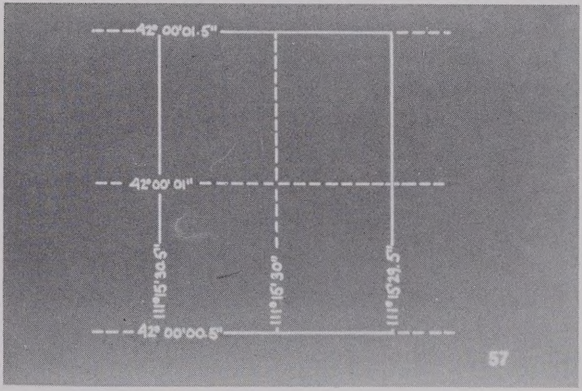
56



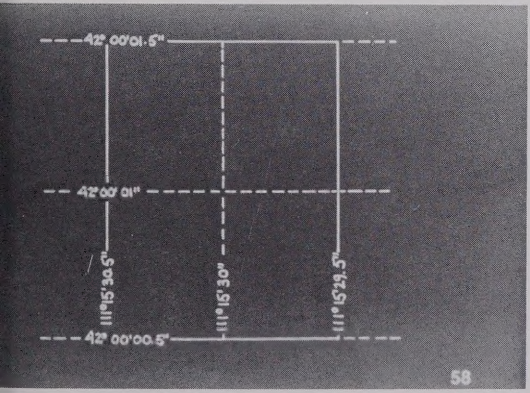
Lat. 42°00'01"N.
Long. 111°15'30"W.

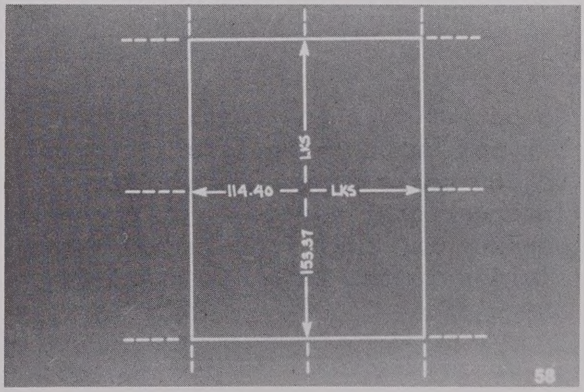
Smallest Unit to Seconds

57

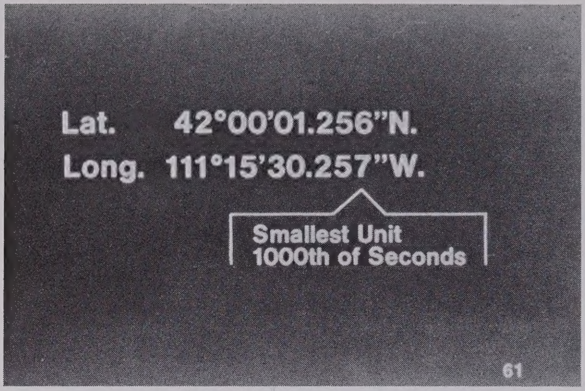


ographic coordinates actually describe an area on the earth's surface, en though common useage refers to "points".





gain an approximate concept of what area a second of latitude covers on e earth, study the above example.

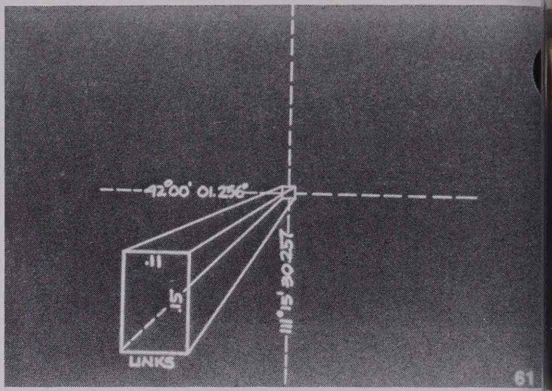


Lat. 42°00'01.256"N.

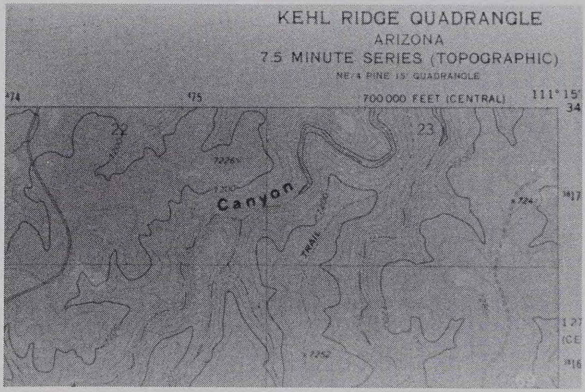
Long. 111°15'30.257"W.

Smallest Unit

1000th of Seconds

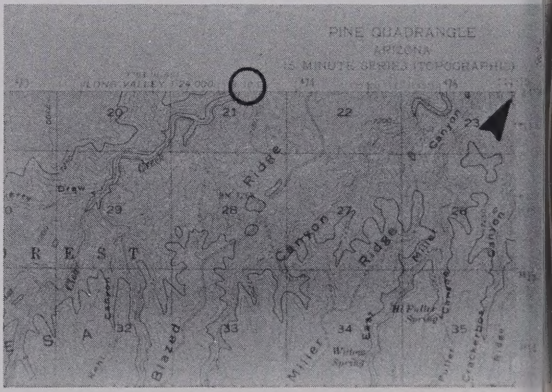


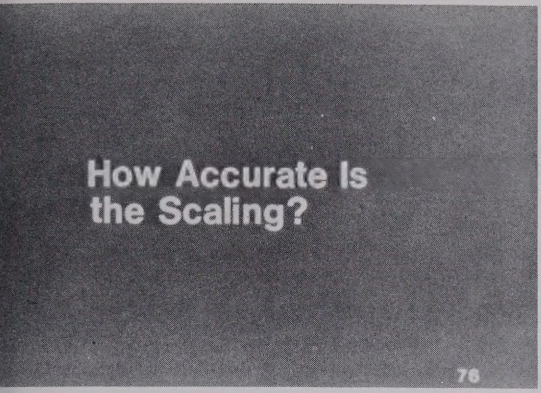
Geographic coordinates reported to thousandths of a second cover an area which is less than the size of a brass cap.



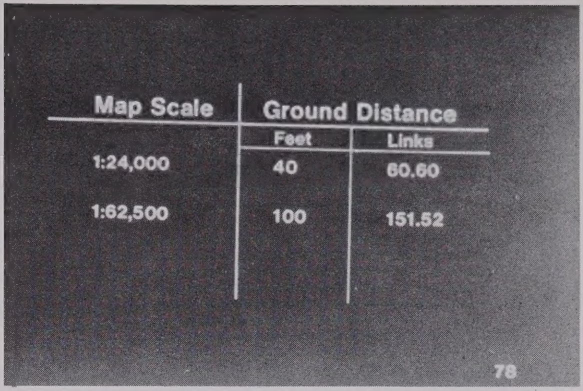
U.S.G.S. topographic maps have a standard of horizontal accuracy which permits scaled points to be reported to better than one secon, but not to one tenth second for 1 to 24,000 scale maps, and...

to better than one tenth minute, but not to one second for 1 to 62,500 scale maps. Note: For instructional purposes, we are considering only factors for latitutdes in the $24^{0} - 51^{0}$ M and P pamphlet.





How Accurate Is the Scaling?



Map Scale	Ground Distance	
	Feet	Links
1:24,000	40	60.60
1:62,500	100	151.52

ery accurate map scaling is possible, however, the probable error of the ap itself is the critical accuracy limit.

EXERCISE NO. 25

1. At a latitude of 39° 46", how much linear distance is represented by one second of geographic latitude? Use the BLM table of M and P facto to arrive at your answer.

2. How much linear distance is represented by one second of geographic longitude at a latitude of 39° 46"?

3. For problems 1 and 2, how would you determine the linear distances on the earth's surface represented by the range, .1 second to .001 second?

4. You are to determine realistic geographic coordinates for a monumented point at the end of a traverse run from a USC&GS (NGS) station which has coordinates reported to the nearest .001 second. The survey equipment and method used have a maximum rated accuracy of 1/5000. The traverse is run at a latitude of approximately 39° , and the total length of the traverse is 161.05 chains. A second traverse is run as a check of the tie, with the result being within .023 chs. of the firs run.

   What are the smallest realistic geographic coordinates you would report for the terminal point?

The geographic position of the furthest southeast point of a dependent resurvey is to be determined, by scaling, from a choice between two U.S.G.S. maps of the same date and same particular area. One map is of the 7.5 minute series, the other is of the 15 minute series.

For which map can the smallest unit of geographic coordinate be reported?

Answers to Exercise No. 25

1. 153.31 + links

2. 118.32 + links

Note: For practical purposes of most cadastral surveys, the above two values would be held to tenths of a link.

3. Multiply 153.31 links or 118.32 links by .1, .01, or .001.

4. The coordinates of the control station indicate enough accuracy to report thousandths of a second if the survey methods used are consisten with a transfer of coordinates within this range of value.

   Our survey method here is limited by definition, to an accuracy of 1 unit in every 5000 units. The check traverse indicates that our survey is well within this accuracy.

   In this case, then, our critical consideration is the maximum rated accuracy of the method and equipment. For a traverse distance of 161.05 chains, we can not expect a better ground position for the terminal point than within a radius of 3.5 links of the true theoretica point (as represented on the plat).

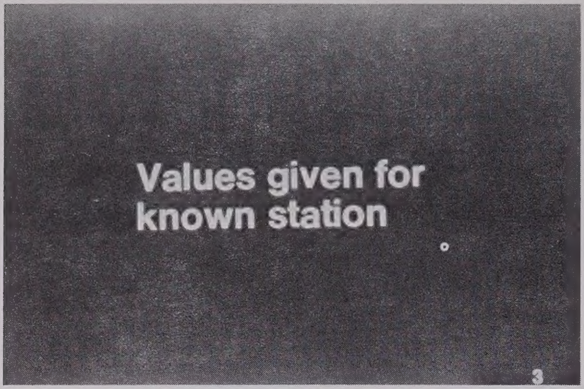
   The geographic coordinates at 39°represent an approximate area of 1.5 links by 1.2 links for each .01 second and an approximate area of 15 links by 12 links for each .1 second.

   Therefore, the smallest realistic geographic coordinates we will report for the terminal point are to the nearest .1 second.

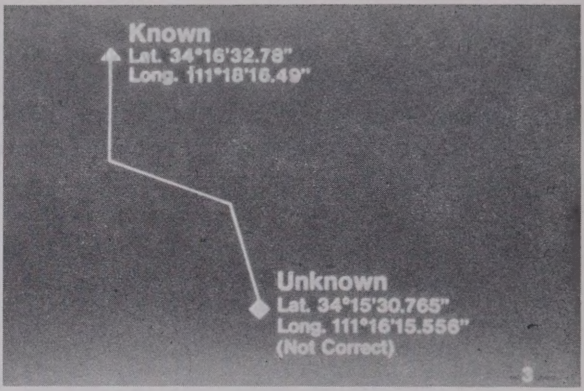
Answers to Exercise No. 25 cont'd.

5. The 7.5 minute series map will yield the smallest most probable geographic coordinates (to one second); the 15 minute series map will give dependable results only to one tenth minute, under our reporting criteria.

REEL TEN



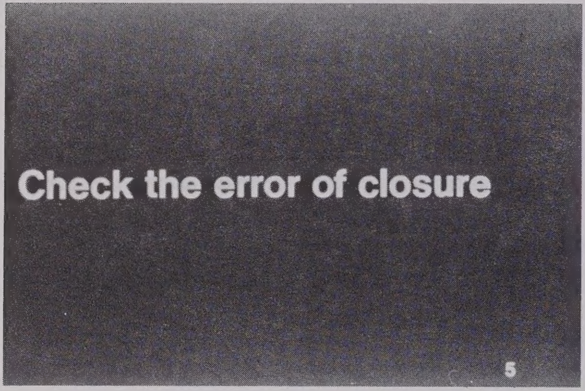
Values given for known station



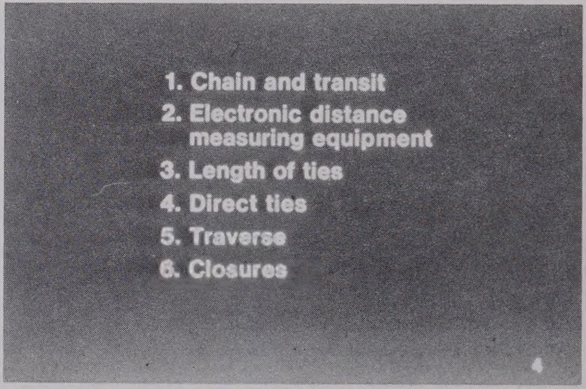
Known
Lat. 34°16'32.78"
Long. 111°18'16.49"

Unknown
Lat. 34°15'30.765"
Long. 111°16'15.556"
(Not Correct)

When reporting geographic values from field survey data the known point accuracy is one critical limit.

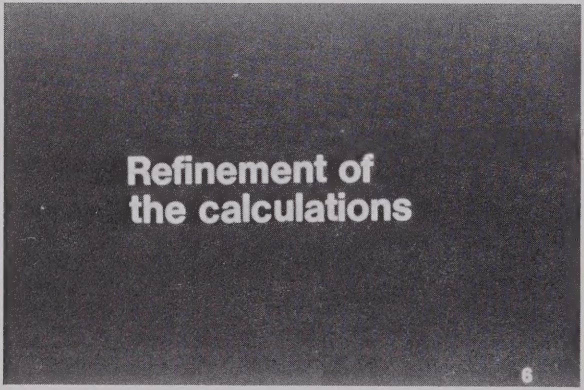


Check the error of closure

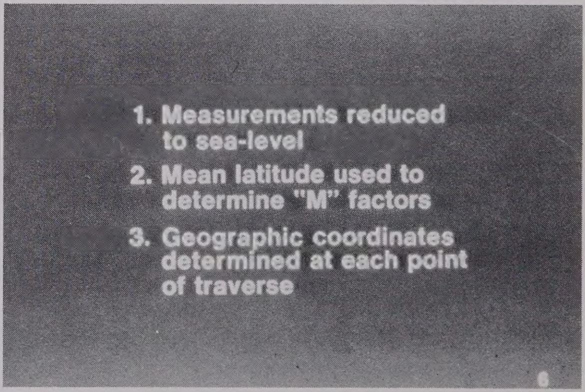


1. Chain and transit
2. Electronic distance measuring equipment
3. Length of ties
4. Direct ties
5. Traverse
6. Closures

The method of survey must be considered ...

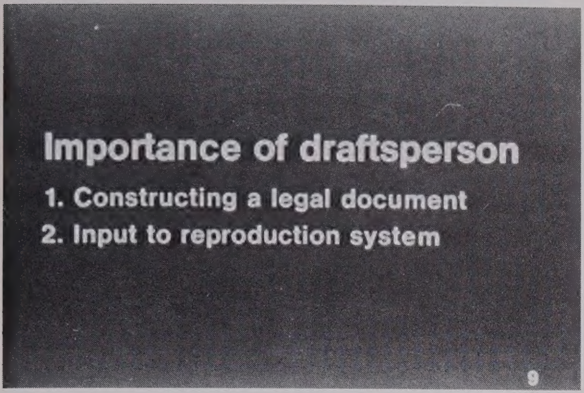


Refinement of the calculations



1. Measurements reduced to sea-level
2. Mean latitude used to determine "M" factors
3. Geographic coordinates determined at each point of traverse

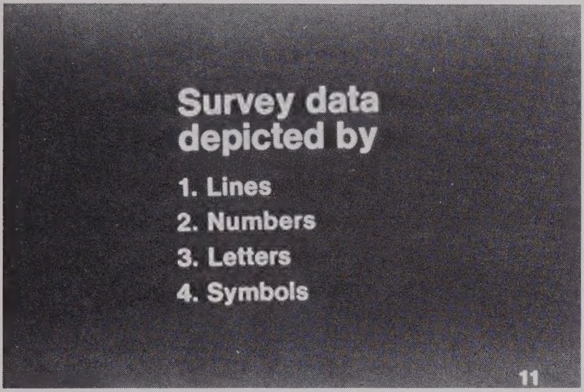
And, how refined are all of the input computations?



Importance of draftsperson

1. Constructing a legal document
2. Input to reproduction system

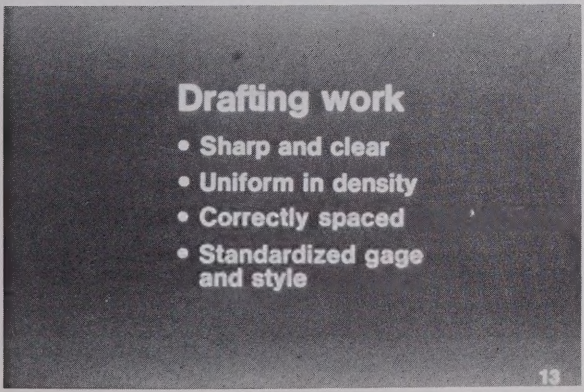
Completed drawings must be of such quality that multiple copies are easily reproduced.



Survey data depicted by

1. Lines
2. Numbers
3. Letters
4. Symbols

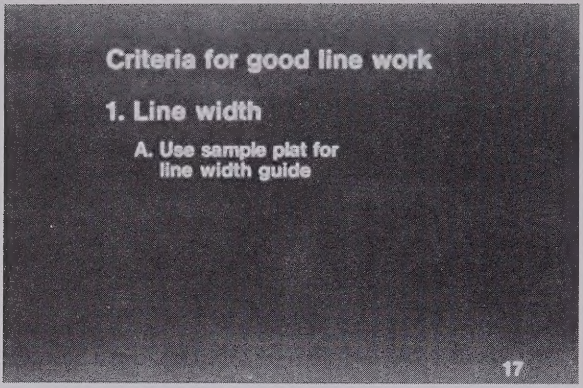
Lines, numbers, letters, and symbols are used to depict data.



Drafting work

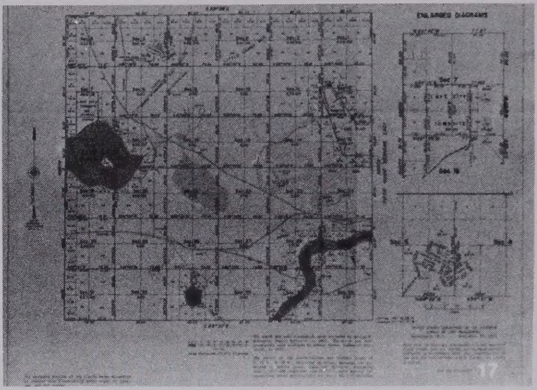
- Sharp and clear
- Uniform in density
- Correctly spaced
- Standardized gage and style

The drafting work must meet certain standards.

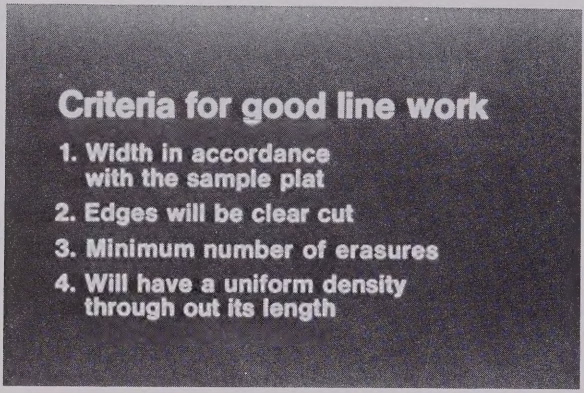


Criteria for good line work

1. Line width
   - A. Use sample plat for line width guide



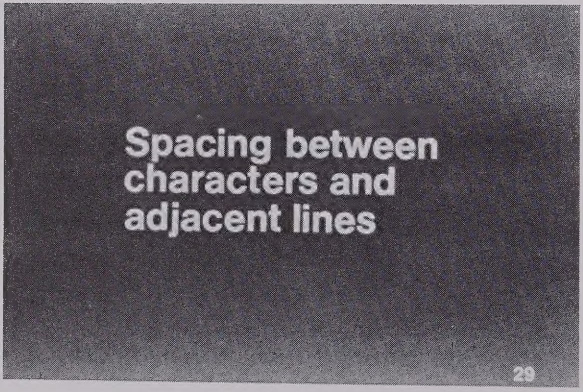
Line widths are not standardized, but guides are available.



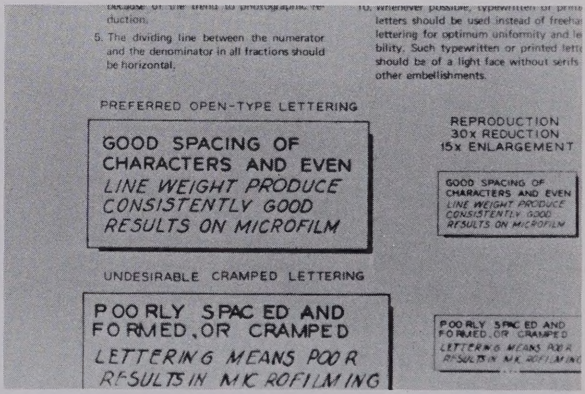
Criteria for good line work

1. Width in accordance with the sample plat
2. Edges will be clear cut
3. Minimum number of erasures
4. Will have a uniform density through out its length

Line quality has several aspects.



Spacing between characters and adjacent lines



duction.

5. The dividing line between the numerator and the denominator in all fractions should be horizontal.

letters should be used instead of freeha
lettering for optimum uniformity and le
bility. Such typewritten or printed lett
should be of a light face without serifs
other embellishments.

PREFERRED OPEN-TYPE LETTERING

GOOD SPACING OF CHARACTERS AND EVEN *LINE WEIGHT PRODUCE CONSISTENTLY GOOD RESULTS ON MICROFILM*

REPRODUCTION
30x REDUCTION
15x ENLARGEMENT

GOOD SPACING OF CHARACTERS AND EVEN *LINE WEIGHT PRODUCE CONSISTENTLY GOOD RESULTS ON MICROFILM*

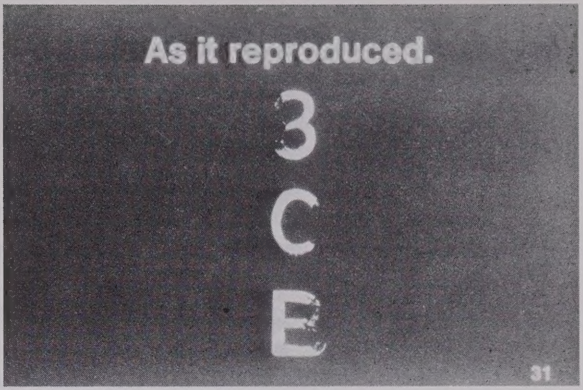
UNDESIRABLE CRAMPED LETTERING

P OO RLY S PAC ED AND FO RMED.OR CRAMPE D *LETTERIN G MEANS POO R RFSULTS IN M K ROFILM ING*

P OO RLY S PAC ED AND FO RMED.OR CRAMPE D *LETTERIN G MEANS POO R RFSULTS IN M K ROFILMING*

Spacing of letters and lines is important.

Variable density may lead to reproduction problems.



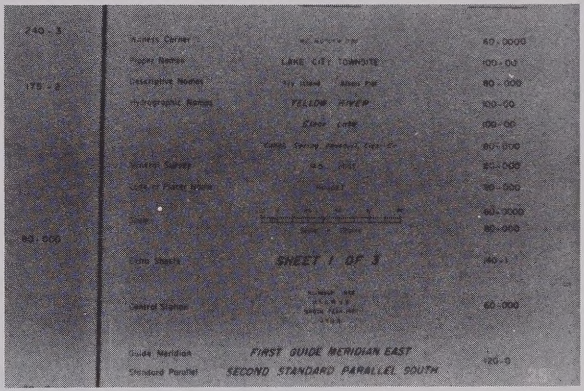
As it reproduced.

3

C

E

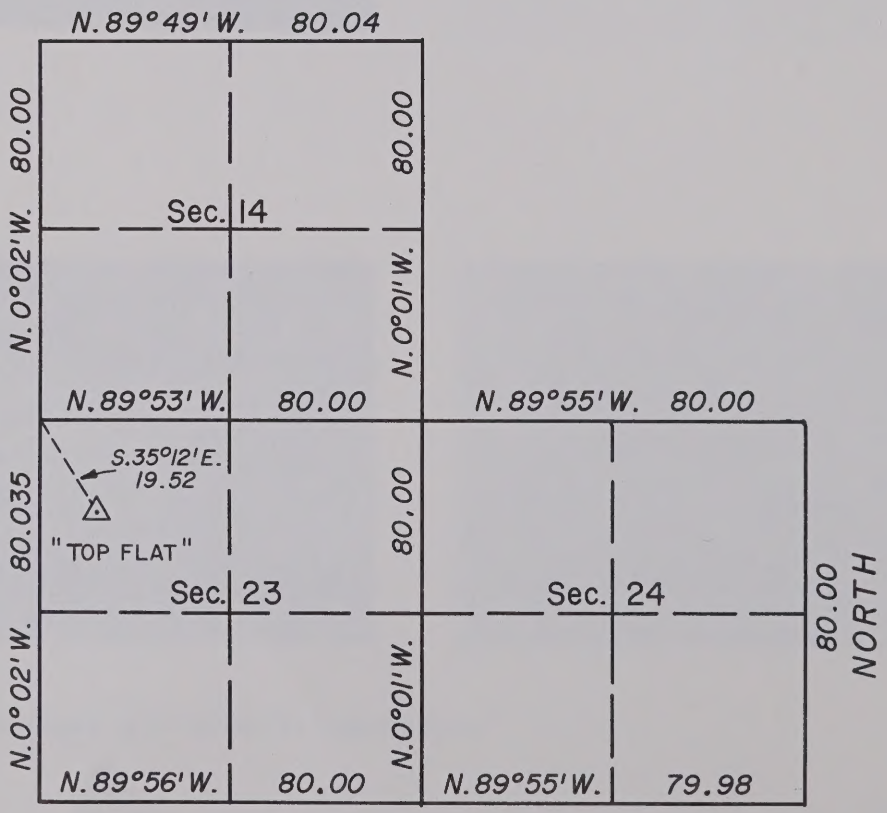
Letters and figures are normally mechanically formed according to the styles and sizes shown in the Manual of Surveying Instructions.



240-3	Witness Corner		60-0000
	Proper Names	LAKE CITY TOWNSITE	100-00
175-2	Descriptive Names		80-000
	Hydrographic Names	YELLOW RIVER	100-00
		Clear Lake	100-00
			80-000
	Mineral Survey	M.S.	80-000
	Lode or Placer Name		80-000
	Scale		60-0000
80-000			80-000
	Extra Sheets	SHEET 1 OF 3	140-1
	Central Station		60-000
	Guide Meridian	FIRST GUIDE MERIDIAN EAST	120-0
	Standard Parallel	SECOND STANDARD PARALLEL SOUTH	

EXERCISE NO. 26

1. Calculate a realistic geographic position for the southeast corner of Section 23. The survey was executed with methods and equipment which allow a maximum of 1/10000 accuracy. An examination of the field notes indicates that better survey data was probably obtained when retracing the lines between Sections 14 - 23 and 23 - 24. "Top Flat" has given geographic coordinates of 45° 47' 02.856" N. and 107° 55' 07.473" W. All of the random lines were run as close to cardinal directions as possible with necessary short traverse lines held to within 1 degree of cardinal. For convenience in this problem, only, accept section closure data without applying convergency considerations. Use a mean elevation of 5500 feet for all computations.



2. Why should thin lines not be used on cadastral survey plats even though they lend themselves well to neat drawings?

3. Name the four categories of depiction on cadastral survey plats.

4. What elements enter into quality lettering of plats?

5. What guide - pen size should be used to letter such features as canals, springs, aqueducts, etc.?

Answers to Exercise No. 26

1. Some application of judgement may be necessary in working with misclosure and method data. In this problem, it is reasonable to accept the .035 south misclosure of Section 23 or the least accurate figure, since virtually all of the random lines run were close to cardinal. However, even if we go with the total misclosure of 9.4 links in Section 14 as the critical accuracy figure, we will still be within the range of better than .1 second. Each instance is still not good enough for .01 second. (1.5 by 1.1 links for .01 second, and 15.3 by 10.7 links for .1 second at 45^{o} 47').

First, let's compute the sea level distances for each line:

(.999737) (19.52) = 19.515 to PT. A

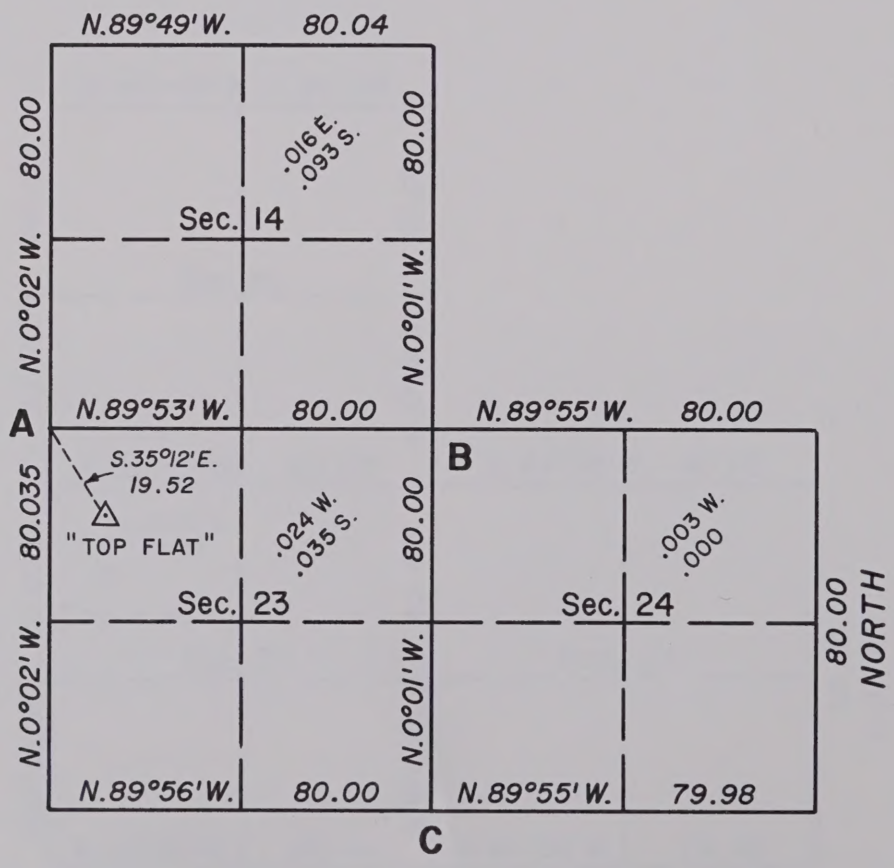
(.999737) (80.00) = 79.979 to PTS. B&C

Now, compute lats. and deps.

11.249W; 15.947N to PT. A

79.979E; .163S to PT. B

.023E; 79.979S to PT. C



nswers to Exercise 26

e M factor for 45° 47' 02.856" = .6515788
(.6515788) (15.947) = 10.391 secs. of geog. lat.

$$\begin{array}{l} 45^\circ\ 47'\ 02.856'' \\ +\qquad\qquad 10.391'' \\ \hline 45^\circ\ 47'\ 13.247'' \end{array}$$ latitude at Point A

$$\begin{array}{l} 45^\circ\ 47'\ 13.247'' \\ +\ 45^\circ\ 47'\ 02.856'' \\ \hline 90^\circ\ 94'\ 16.103 \div 2 = 45^\circ\ 47'\ 08.052'' \end{array}$$ mean latitude

ote: An interpolation for the M factor for 45° 47' 02.856" would not be necessary for the data used here; however, for example purposes, our figures will be carried out much further than needed. We have already established that the best we can do will be to .1 second.

Answers to Exercise No. 26 cont'd.

1. Cont'd.

The M factor for 45° 47' 13.247" = .6515785

(.6515785) (.163) = .106 SECS. OF GEOGRAPHIC LATITUDE

$$\begin{array}{lr} & 45^\circ\ 47'\ 13.247'' \\ - & .106 \\ \hline & 45^\circ\ 47'\ 13.141'' \end{array} \quad \text{(LAT. AT PT. B)}$$

$$\begin{array}{lr} & 45^\circ\ 47'\ 13.247'' \\ + & 45^\circ\ 47'\ 13.141'' \\ \hline & 90^\circ\ 94\ \ 26.388 \end{array} \div 2 = 45^\circ\ 47'\ 13.194'' \ \text{(MEAN LAT.)}$$

The M factor for 45° 47' 13.141" = .6515785

(.6515785) (79.979) = 52.113 SECS. OF GEOG. LAT.

$$\begin{array}{lr} & 45^\circ\ 47'\ 13.141'' \\ - & 52.113'' \\ \hline & 45^\circ\ 46'\ 21.028'' \end{array} \quad \text{(LAT. AT PT.C)}$$

$$\begin{array}{lr} & 45^\circ\ 47'\ 13.141'' \\ + & 45^\circ\ 46'\ 21.028'' \\ \hline & 90^\circ\ 93'\ 34.169'' \end{array} \div 2 = 45^\circ\ 46'\ 47.084'' \ \text{(MEAN LAT.)}$$

The M factors for each mean latitude are now determined:

45° 47' 08.052" - .6515786

45° 47' 13.194" - .6515785

45° 46' 47.084" - .6515793

Multiply these "meaned" M factors times each line's **latitude**:

$$\begin{array}{rcrl} (.6515786)\ (15.947) & = & 10.391'' & + \\ (.6515785)\ (\ \ .163) & = & .106'' & - \\ (.6515793)\ (79.979) & = & \underline{52.113''} & \underline{-} \\ & & 41.828 & - \end{array}$$

° 47' 02.856" N	(BEGINNING LATITUDE)
41.828"	(ALGEGRAIC DIFFERENCE)
5° 46' 21.028"	(FINAL LATITUDE AT THE SOUTHEAST CORNER OF SECTION 23 - In this case, it is the same as in our preliminary computations; However, we are demonstrating a process here which you will probably find useful in some of your future projects.)

ne realistic geographic latitude at the southeast corner of Section 23 is

45° 46' 21.0" N.

ow, interpolate the P factors for each mean latitude:

45° 47' 08.052" - .9312835

45° 47' 13.194" - .9313072

45° 46' 47.084" - .9311865

ltiply the "meaned" P factors times each line's dep.

(.9312835) (11.249) = 10.476" +

(.9313072) (79.979) = 01' 14.485" -

(.9311865) (.023) = .021" -

01' 04.030" -

107° 55' 07.473" W	(BEGINNING LONGITUDE)
- 01' 04.030"	(ALGEBRAIC DIFFERENCE)
107° 54' 03.443"	(FINAL LONGITUDE AT THE SOUTHEAST CORNER OF SECTION 23)

The realistic geographic longitude at the southeast corner of Section 23 is:

107° 54' 03.4" W.

Remember, we carried our figures out further than necessary for the data given; for a high order traverse, it may be desired to work with calculations of this accuracy, and to consider such factors as meaned bearings. Distances, accuracy inputs, and reporting requirements are all important considerations.

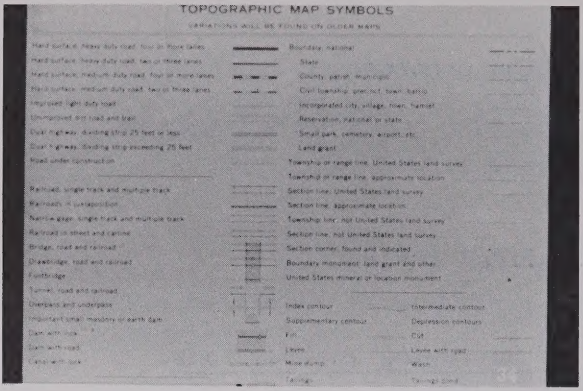
nswers to Exercise No. 26 cont'd.

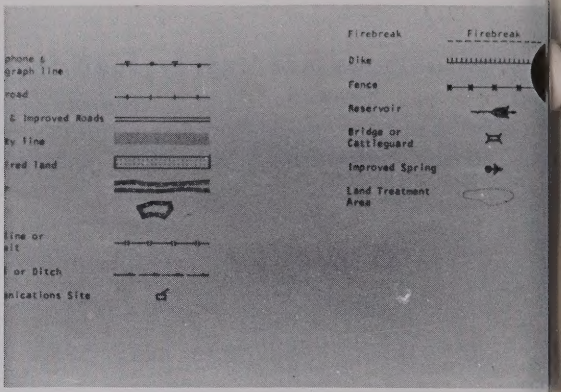
Thin lines are easily lost in reproduction processes.

. Lines, numbers, letters, symbols.

. Density, guide, pen size, position, spacing, style.

. 80 - 000. See page 201, 1973 Manual of Surveying Instructions.

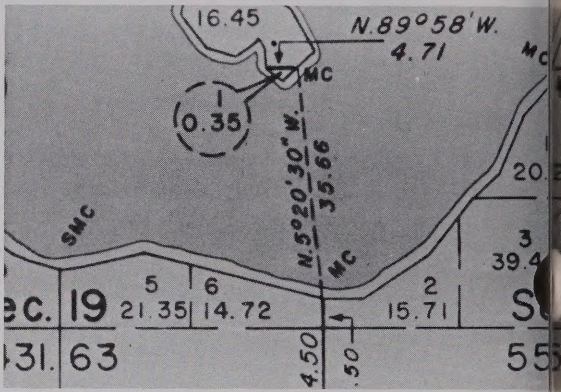

TOPOGRAPHIC MAP SYMBOLS



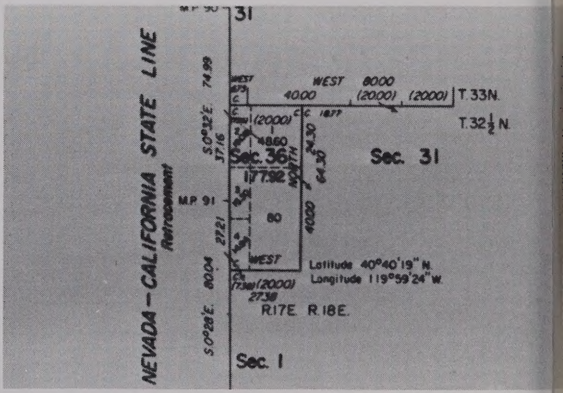
Standard symbol references and the BLM symbol handbook are guides for cadastral survey plats. Always label BLM symbols.

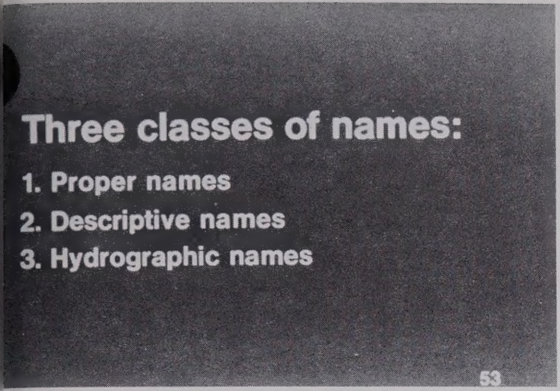
NOTE: Some of the symbols shown on the U.S.G.S. standard symbol sheet are not to be used on BLM plats.

Some line depictions are frequently used on plats...



Others are labeled when used.





Three classes of names:

1. Proper names
2. Descriptive names
3. Hydrographic names

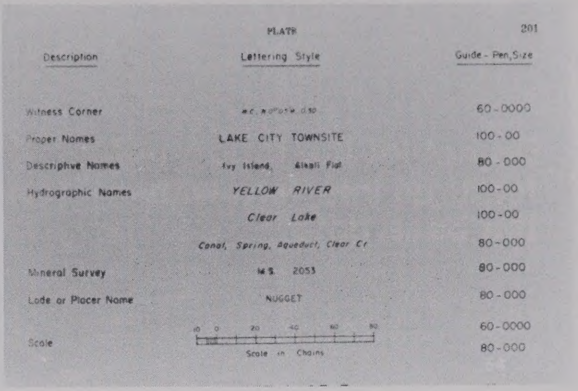
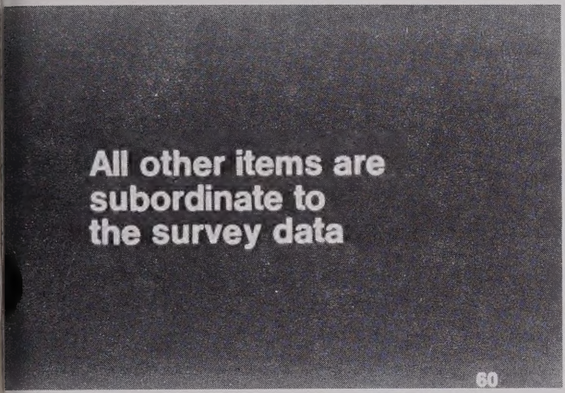


PLATE 201

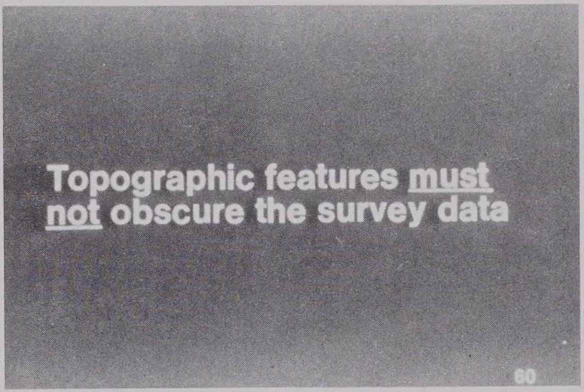
Description	Lettering Style	Guide - Pen,Size
Witness Corner	[illegible]	60-0000
Proper Names	LAKE CITY TOWNSITE	100-00
Descriptive Names	Ivy Island, Alkali Flat	80-000
Hydrographic Names	YELLOW RIVER	100-00
	Clear Lake	100-00
	Canal, Spring, Aqueduct, Clear Cr	80-000
Mineral Survey	M.S. 2053	80-000
Lode or Placer Name	NUGGET	80-000
Scale	Scale in Chains	60-0000 80-000

10 0 20 40 60 80

The three classes of names have standard lettering.



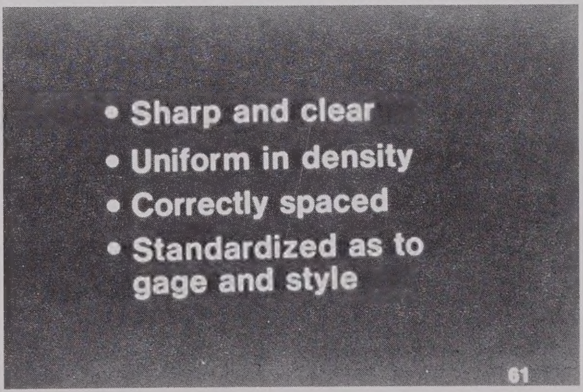
All other items are subordinate to the survey data



Topographic features must not obscure the survey data

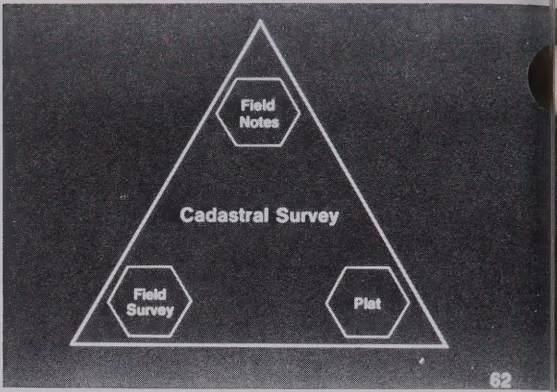
Topographic feature depiction is desireable within certain limits.

Cadastral drafting work has the same standards of neatness as all drafting work.



- Sharp and clear
- Uniform in density
- Correctly spaced
- Standardized as to gage and style

Do not let the topography features interfere with the base data



Field Notes

Cadastral Survey

Field Survey

Plat

Remember, the plat is a part of the completed survey, and is required by law.

EXERCISE NO. 27

1. Place an X in front of the following types of lines which should be labeled on cadastral survey plats.

    base lines
    section lines
    principal meridians
    mineral survey lode lines
    standard parallels
    guide meridians
    withdrawal lines
    state boundaries
    sectional correction lines
    meander lines
    metes and bounds lines
    longitudinal lines

2. State the general guideline in determining whether or not to depict topographic features on a cadastral survey plat.

3. Symbols, labels, both symbols and labels.

    What do the above items refer to in the construction of survey plats?

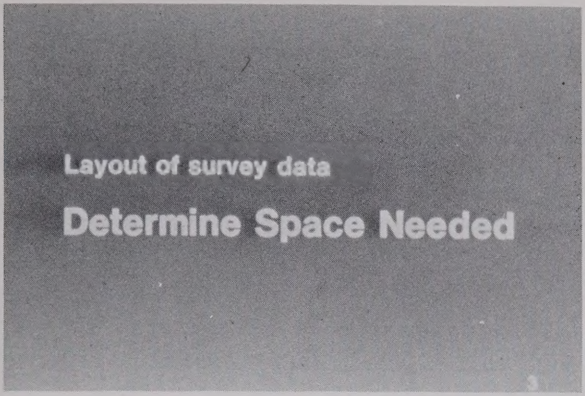
Answers to Exercise No. 27

1. The following should be labeled:

   base lines, principal meridians, standard parallels, guide meridians, state boundaries, sectional correction lines.

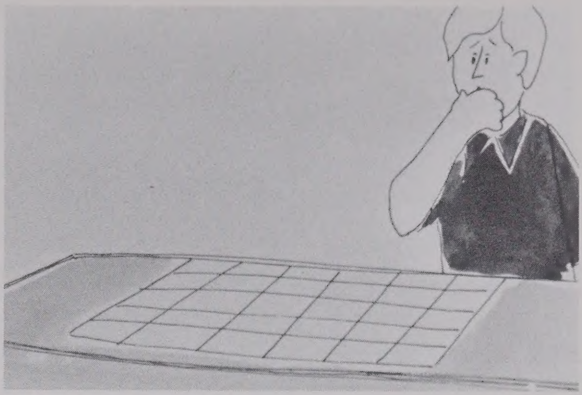
2. Topographic features are subordinate to the survey information and should be omitted if the showing of them interferes with the survey data in any manner.

3. Line designations (protraction lines, control lines, tie lines, boundary lines, etc.) are depicted by various combinations of solid, dashed, and labeled lines.

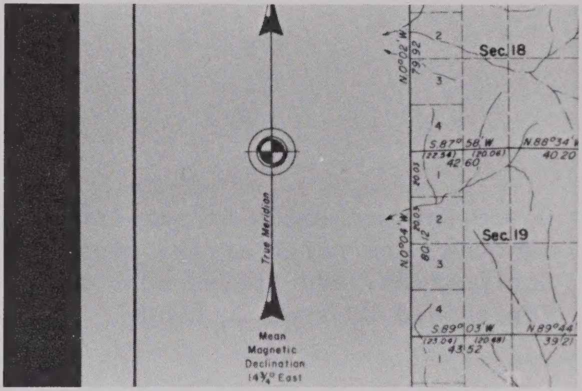


Layout of survey data

Determine Space Needed

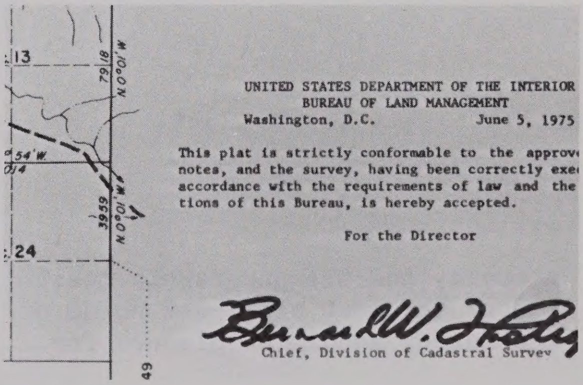


Planning the job is of prime importance.



The plat borderline may be slightly enlarged if necessary.

NOTE: Slight deviations exists in some BLM offices in the required borderline size.


13
24
79.18
N 0°00' W
39.59
N 0°10' W
54' W
49

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Washington, D.C. June 5, 1975

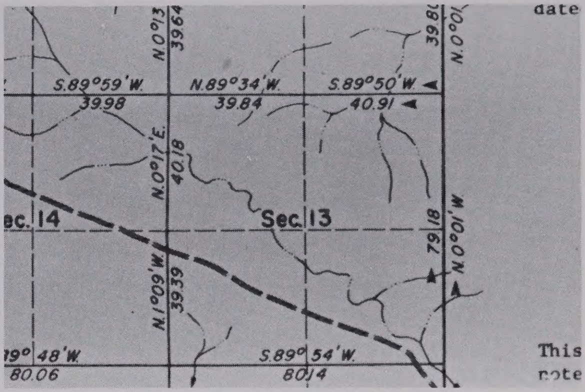
This plat is strictly conformable to the approv
notes, and the survey, having been correctly exe
accordance with the requirements of law and the
tions of this Bureau, is hereby accepted.

For the Director

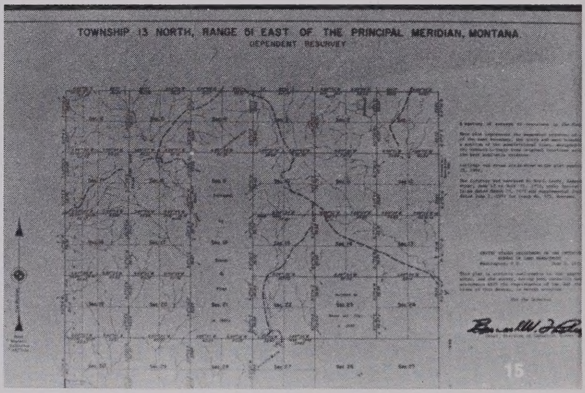
Chief, Division of Cadastral Survey

A three by four inch space is normally reserved in the lower right hand corner for the Certificate of Acceptance, although it is permissable to place it elsewhere.

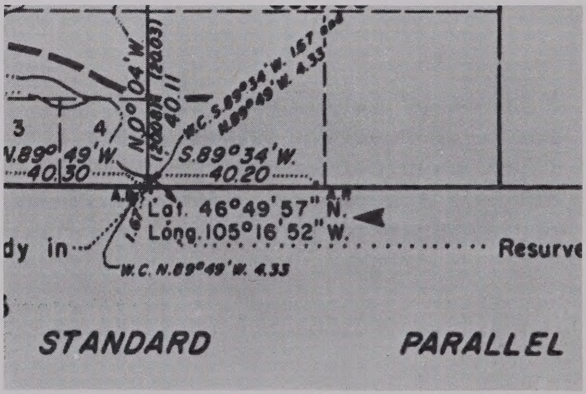
Surveyed lines will need to have space available for bearing and distance notations.



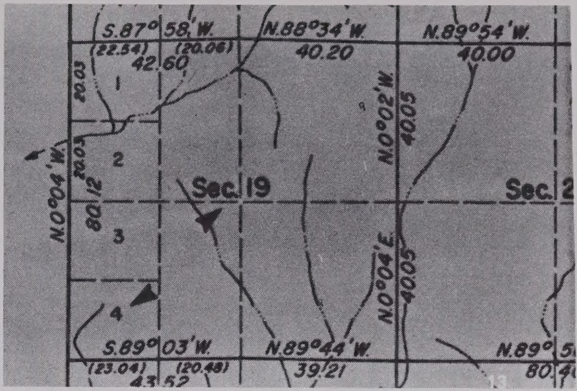
Space for memoranda of varying lengths, the north arrow, magnetic declination, and titles near the top should be kept in mind.


TOWNSHIP 13 NORTH, RANGE 51 EAST OF THE PRINCIPAL MERIDIAN, MONTANA
DEPENDENT RESURVEY
15

A scale, and the geographic position of the most southeast point of the survey should be planned for.



Section, lot, and other unit identification will be required.



1. What are the usual dimensions of the border line for a cadastral survey plat?

2. What are the definite dimensions of the cadastral plat sheet size?

3. What is the key word in the proper layout of survey data for plats?

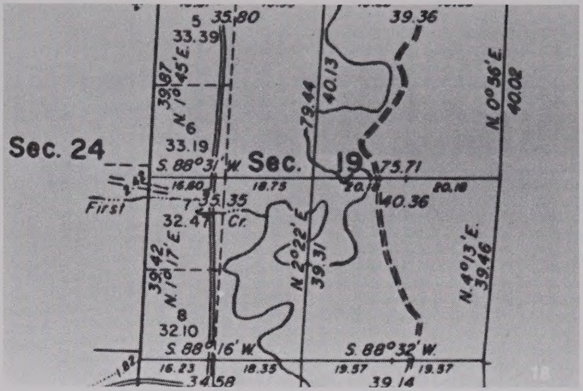
Answers to Exercise No. 28

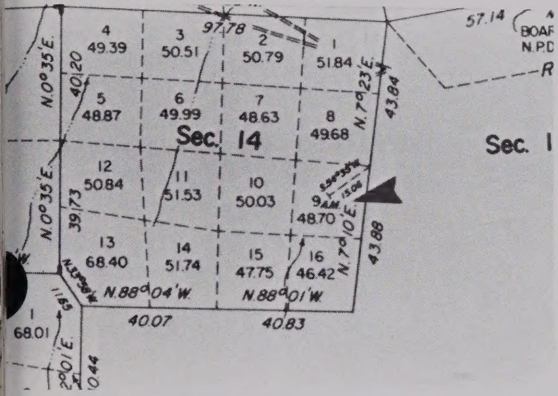
1. 16 ½ X 20 inches.

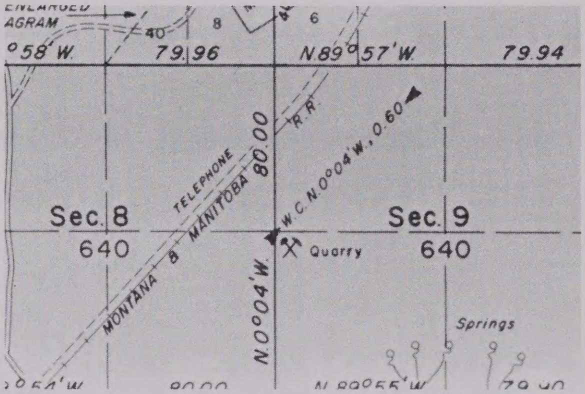
2. 19 X 24 inches.

3. Planning

or revised areas of dependent esurvey plats, space will be eeded for new area and lot umber notations.

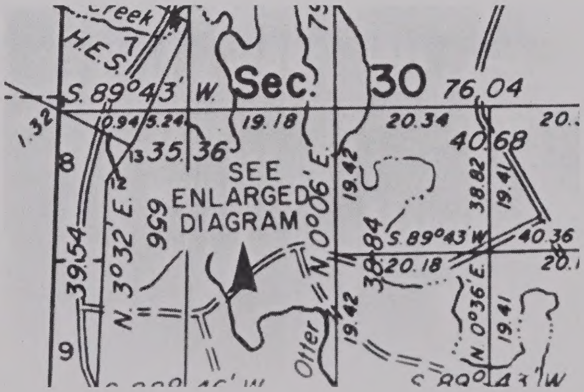




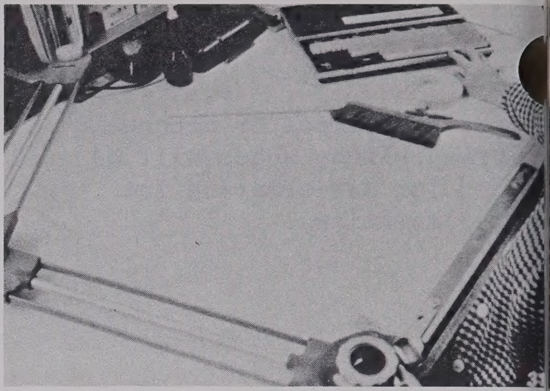


eave room for the types of corners which must be designated on the plat.

particular reference notation may ave to be provided for.



Again, planning will save costly revisions later on.



EXERCISE NO. 29

. A plat of a dependent resurvey is being constructed. One lot departs more than 5% from the original plat area, and space on the resurvey plat will need to be planned for, to show the new area and lot number. Will space be needed on the resurvey plat to show a new section area?

2. A resurvey plat is being constructed of an area which formerly had protracted section completions. In the resurvey, large distortions of the completed parts of certain sections are found. No patents or entries have been made in any of the uncompleted portions of the sections. Is it necessary to depict the protracted subdivisions on the resurvey plat?

3. National Park or Forest boundaries should be symbolized and labeled on cadastral survey plats. TRUE or FALSE

4. The direct connecting course and distance from the true point to its witness corner are shown on the plat. TRUE or FALSE

5. Name five types of survey corners which should be labeled on the plat.

1. No. See 9-86, 1973 Manual of Surveying Instructions.

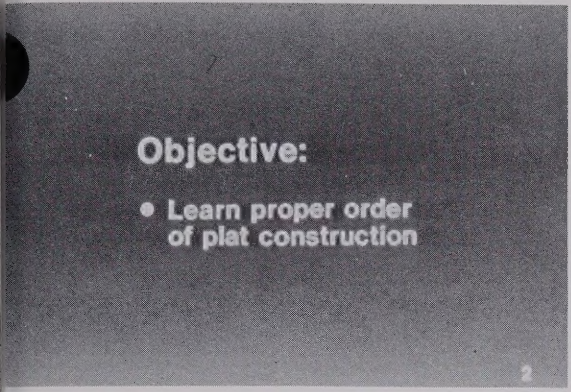
2. No. See 9-23, 1973 Manual of Surveying Instructions.

3. False in the general sense. However, if a boundary is part of a metes and bounds reservation, it is shown by virtue of being a surveyed line. Also, an administrative determination may require special treatment of these types of boundaries.

4. True.

4. Angle points, meander corners, closing corners, mile monuments, witness corners, ...

ORDER OF PLAT CONSTRUCTION



Objective:

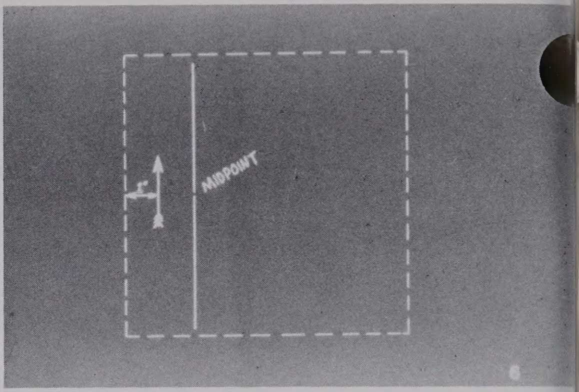
- Learn proper order of plat construction

To assist the draftsperson with the drawing phase, an order of plat construction is suggested.

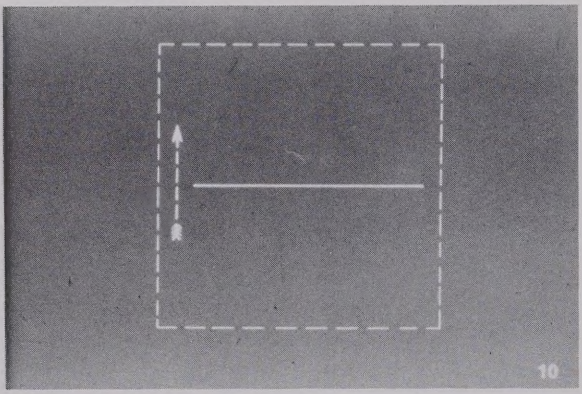
After orienting the paper and aligning the drafting machine, pencil in a borderline.

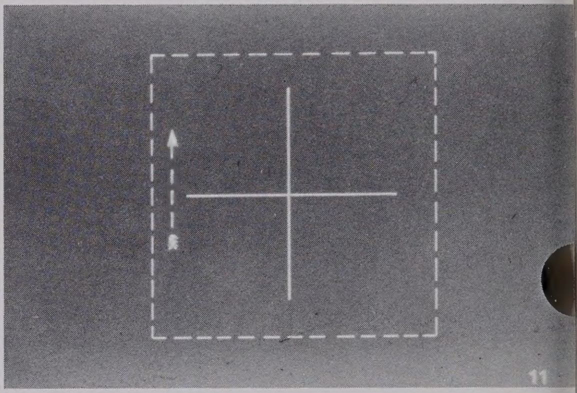
A penciled borderline will allow easy revision if it is found that more space will be needed later on.

Center the north arrow between the two north and south borderlines and one inch from the west borderline.



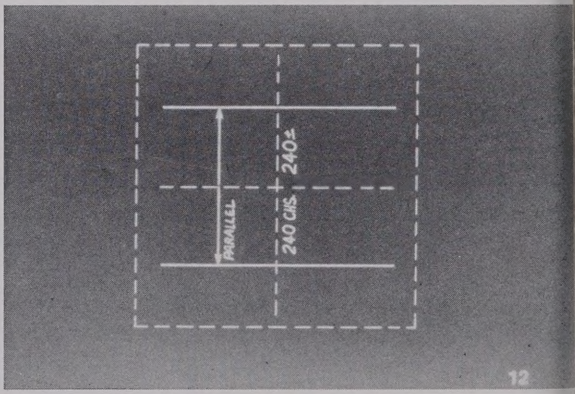
Regular Subject



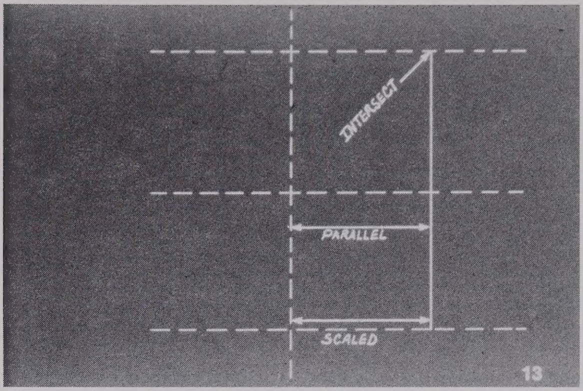


Pencil in an east-west and a north-south center line of the township.

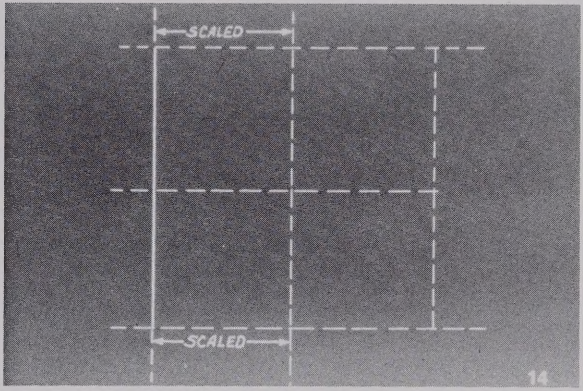
Scale off points on the north-south centerline for the north and south boundaries, and draw lines parallel to the east-west centerline.



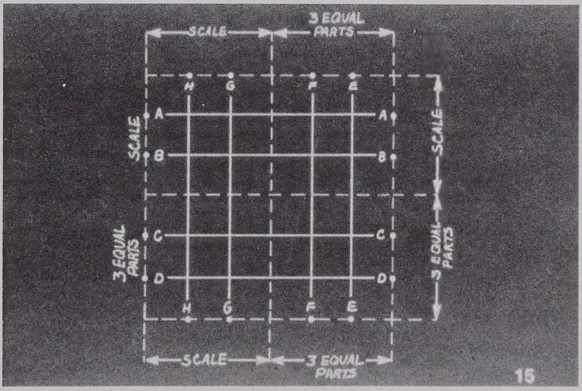
Draw the east boundary parallel to the north-south centerline.

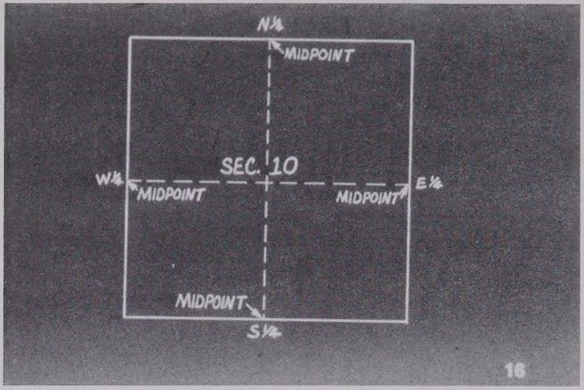


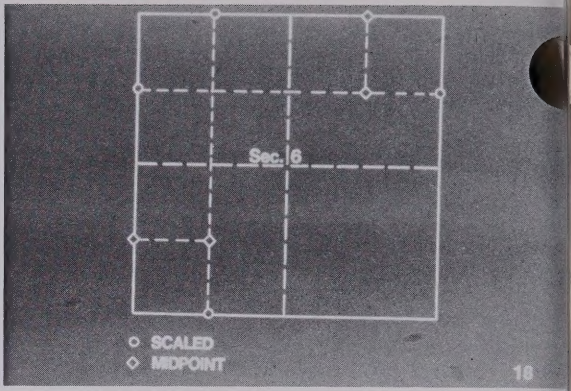
Scale points on the north and south boundaries, and connect them to form the west boundary.



Draw in the section lines by connecting like points on the township boundaries.

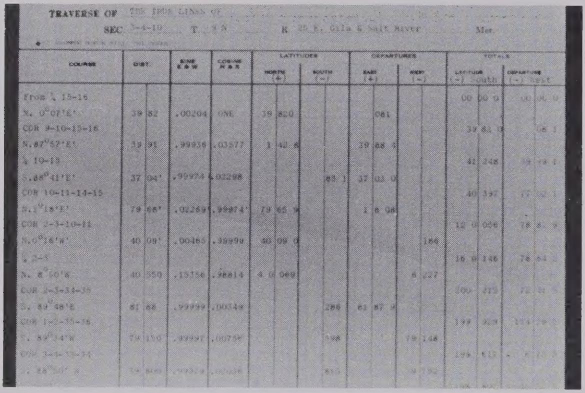


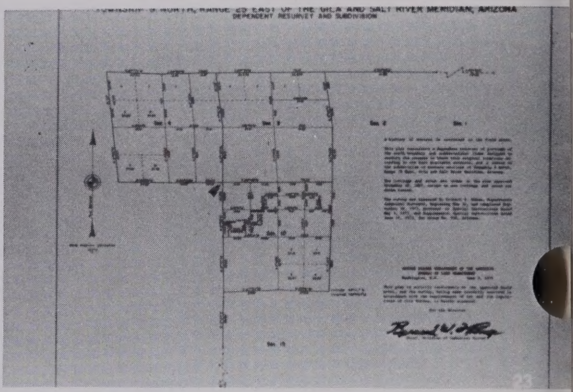




Protracted lines of regular sections are controlled by midpoint positions; protracted lines of **fractional** sections are controlled by scaling.

Irregular Subject

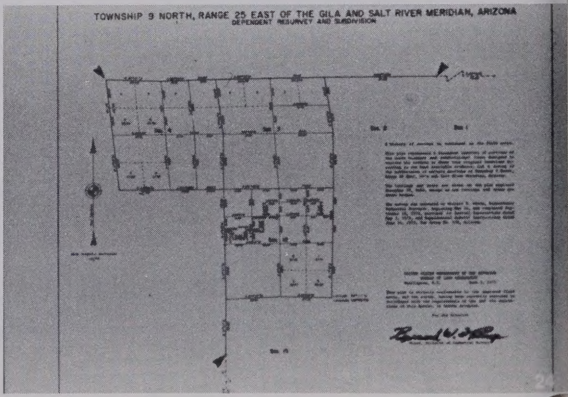



TOWNSHIP 9 NORTH, RANGE 25 EAST OF THE GILA AND SALT RIVER MERIDIAN, ARIZONA
DEPENDENT RESURVEY AND SUBDIVISION
23

Irregular townships including those containing meanderable bodies of water or tracts, are laid out from the survey data by the method of total latitudes and departures relative to a selected origin point.

NOTE: Another method used by some draftspersons is to plot by bearing and distance. Experience leads to diversified individual techniques.

The points most distant from the origin are plotted to facilitate centering of the total subject.


TOWNSHIP 9 NORTH, RANGE 25 EAST OF THE GILA AND SALT RIVER MERIDIAN, ARIZONA
DEPENDENT RESURVEY AND SUBDIVISION
24

EXERCISE NO. 30

1. An _______________ _______________ is plotted by the method of total latitudes and departures.

2. Why should the plat's borderline first be drawn in pencil?

3. How are the protracted centerlines of regular sections controlled?

4. What is the main criteria in selecting a point of origin for the method of total latitudes and departures?

Answers to Exercise No. 30

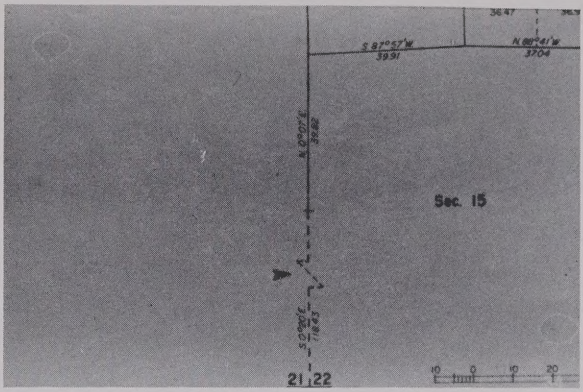
1. irregular boundary

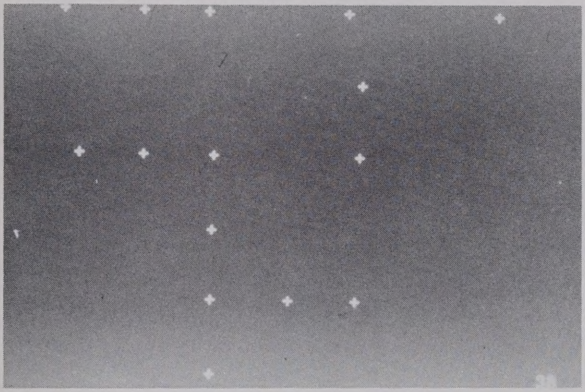
2. A later enlargement of space may be needed.

3. Connect the midpoints on opposite boundaries of the section.

4. The point should be near the center of the space determined for the subject.

Tie line depictions may be lengthened or shortened as desired.

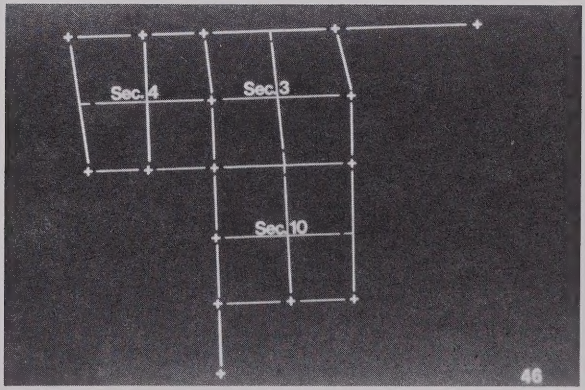




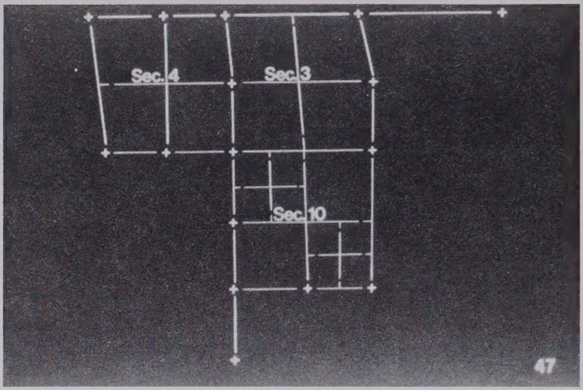
Continue with the plotting of points on the exterior, only where bearing changes occur, by the total latitudes and departures method; then, follow the same method for interior corners.

After connecting the section and other control points, draw in the section centerlines by either midpoint or scaled control, as appropriate.

NOTE: An alternate method often used is to connect the quarter corner points by bearing and distance.

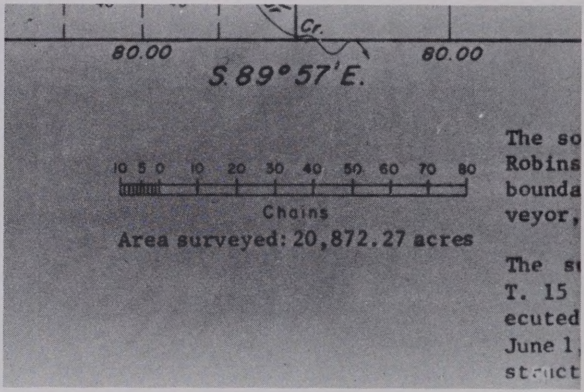


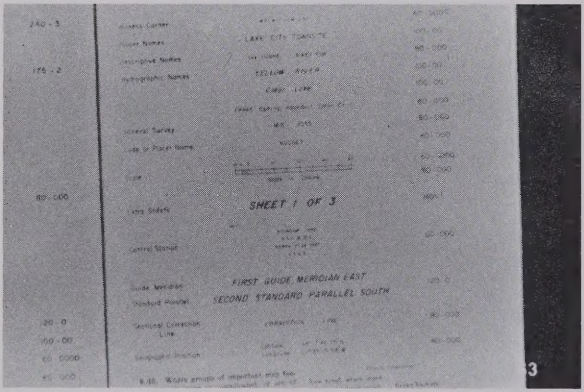
The lines of lesser section subdivisions are also drawn from midpoint or scaled positions.

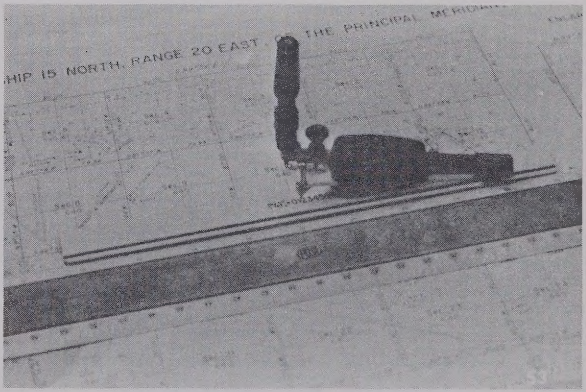


Completing the Plat

Now, pencil in the bar scale, centered to the subject, and adjusted up or down to fit conditions.

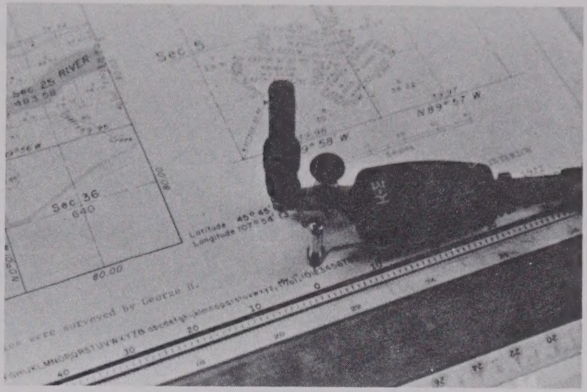


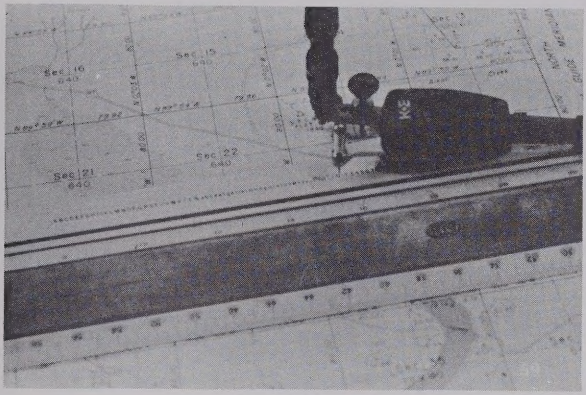

SHEET 1 OF 3
FIRST GUIDE MERIDIAN EAST
SECOND STANDARD PARALLEL SOUTH
3



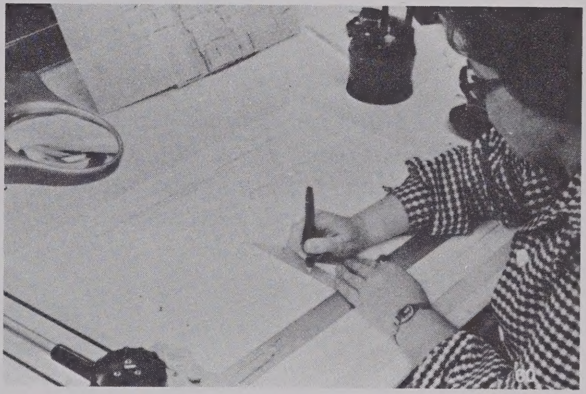
Next, ink in the titles, base lines, meridians, parallels, section numbers and areas, bearings, distances, lot numbers and areas, witness corner data, bar scale values, and special corner designations (such as closing corners), using the pen numbers and guides called for in the Manual of Surveying Instructions.

Using an 80 guide and a triple aught pen, add the unit of measurement, control lines, geographic position, north arrow, and mineral survey identification.



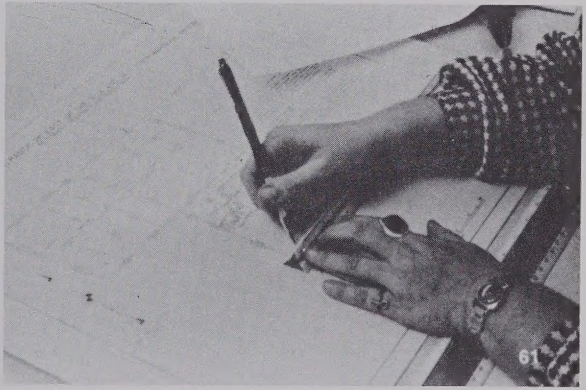


Control station data is inked next with a 60 guide and triple aught pen...

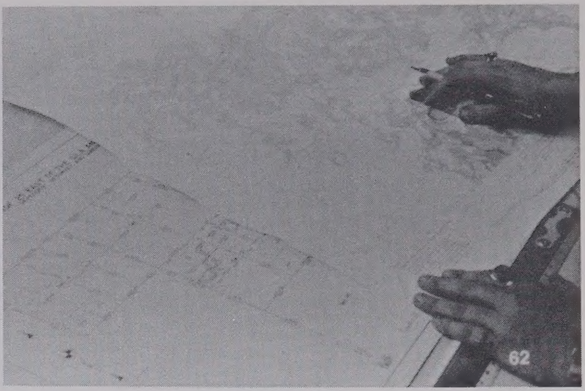


Then, finish the line work.

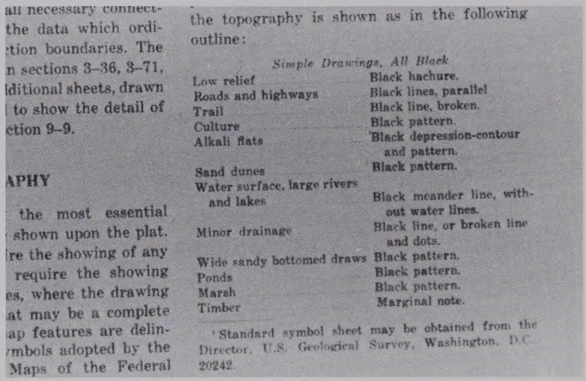
Now, scale in, with pencil, the topography and culture calls of the field notes.



With the use of available source information (quad sheets, highway plans, etc.), extend the topographic or other items through the surveyed area.



Again, using the Manual of Surveying Instructions as a guide, ink in the needed topographic and cultural names and features.



all necessary connect-
the data which ordi-
tion boundaries. The
n sections 3–36, 3–71,
lditional sheets, drawn
to show the detail of
ction 9–9.

APHY

the most essential
shown upon the plat.
re the showing of any
require the showing
es, where the drawing
at may be a complete
ap features are delin-
mbols adopted by the
Maps of the Federal

the topography is shown as in the following outline:

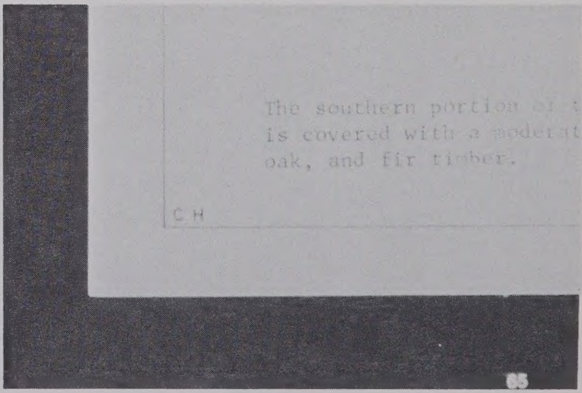
Simple Drawings, All Black

Low relief	Black hachure.
Roads and highways	Black lines, parallel
Trail	Black line, broken.
Culture	Black pattern.
Alkali flats	Black depression-contour and pattern.
Sand dunes	Black pattern.
Water surface, large rivers and lakes	Black meander line, without water lines.
Minor drainage	Black line, or broken line and dots.
Wide sandy bottomed draws	Black pattern.
Ponds	Black pattern.
Marsh	Black pattern.
Timber	Marginal note.

---

[1] Standard symbol sheet may be obtained from the Director, U.S. Geological Survey, Washington, D.C. 20242.

Be proud when you put your initials on the plat



The southern portion of
is covered with a moderat
oak, and fir timber.

C H

Your initials on the plat will complete the job.

EXERCISE NO. 31

Place the following phrases in numerical order as they relate to the sequence of cadastral plat construction.

Ink in cultural and topo items

Leroy lettering (ink) of title, section numbers, areas, etc.

Draw in E-W centerline, township boundaries, etc. (pencil)

Letter in hydrographic, cultural, and topo names

Center borderline (pencil)

Scale in items of topography on section lines

Place North arrow (pencil)

Pencil in bar scale

Ink in all line work

Extend topo and cultural features through the sections

Align drafting machine with paper

Answers to Exercise No. 31

* 11 Ink in cultural and ...

* 6 Leroy lettering (ink) ...

4 Draw in E-W centerline ... (pencil)

10 Letter in hydrographic ...

2 Center borderline (pencil)

8 Scale ... topography ... section lines

3 Place North arrow (pencil)

5 Pencil in bar scale

* 7 Ink in all line work

9 Extend topo and cultural ...

1 Align drafting machine ...

* The order of inking-in line work and lettering is not absolute; considerable diversity and judgement is applied to all cadastral drafting work, depending on the draftsperson's experience and skill.

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